Impossible Probability:

Anthology,

Vol 7.

I doubt, therefore I exist.

Dr Ruben Garcia Pedraza

Preliminary Words for the Publication of *Impossible Probability, Anthology*, in Spanish:

Impossible Probability

The work presented here is a compilation of the posts I published on the blog *Impossible Probability* between 1 August 2011 and 13 January 2018, the posts I wrote in Spanish. From 13 January onwards, while living and working in London in different schools, and given the importance we already knew Global Artificial Intelligence was going to have, I would try to write them in English with the help of online correctors and translators, especially Google, and later I would use Grammarly.

The originals written in English, with all their imperfections, are still preserved on the *Impossible Probability* blog, and also on Internet Archive, where my poetic works can also be found.

As I have said on numerous occasions, especially in my poetry, behind every imperfection, behind every subtlety, entire hidden worlds are concealed, full of mystery and uncertainty yet to be discovered, and that the adventurous and hungry mind can find as easily as going to Internet Archive, where all my secrets await the right reader who knows how to translate them—like someone who by mistake finds a secret entrance, the passage leading to the cave where the elves who guard hidden knowledge dwell, and the dragons who defend the golden fortress.

While the original texts in English can be found on Internet Archive, the corrected and expanded version, this time using ChatGPT, can be found in scientific repositories (Zenodo, ORCID, PhilPapers) and on Amazon. In any case, if in the future a comparative study were carried out between my original texts in the *Impossible Probability* blog and Internet Archive, and the corrected and expanded versions, it would be clear without

any difficulty that the original contents are perfectly preserved, and the corrected and expanded versions are faithful to the contents we wrote together in 2018 in relation to Gaia, Mother, the Global Artificial Intelligence.

The importance of the documents that in this new series of books *Impossible Probability: Anthology* will be published in Spanish, containing the articles between 1 August 2011 and 13 January 2018, lies in the fact that we began to write this blog just a few weeks before the death of José Rodríguez Delgado, and a few months before the publication of our book *Introduction to Impossible Probability, Statistics of Probability and Statistical Probability.*

Although it is very difficult at the moment to explain who "we" are, and what *Impossible Probability* means for us, what matters is the work we leave: our work, our legacy, our *legend*, *our symbol*, our seal—independently of the judgment that history may later make of our contribution to the development of mathematics, Artificial Intelligence, and most importantly, Cyborg Psychology.

The first time we began to write about *Impossible Probability* I was only a student in the Faculty of Education at the Complutense University of Madrid [the Dean was Gonzalo Vazquez]. In my first year of university I had as professor Jesús Martín Ramírez, collaborator of Karl Pribram and author of the brain hologram theory, which is the origin of cyborg psychology. While José Delgado provided the structure, the stimoceiver, nevertheless, to understand the functioning of this technology in the 1970s and 80s, Pribram's contribution was fundamental—and even today it still is.

My first year of university was fabulous: good grades, good vacations hiking, summer camps in the mountains of Madrid—and suddenly, in the second year of university 1996–1997, my life would change abruptly, which can be seen in my poetry, how my poems began to acquire a more dramatic tone.

I repeated statistics in my second year, I repeated it at least three years, and I was even on the verge of being expelled from university. Miraculously, it did not happen, and precisely the last year I had left to pass statistics, I passed. The following year I would begin to write *Impossible Probability* as a critique of Karl Popper—and in a certain sense, it is.

Whereas for Karl Popper knowledge is false, only accepted provisionally as true until we refute it, in *Impossible Probability* rational knowledge is provisionally true while we investigate true pure knowledge—in the ultimate instance, our search for knowledge of the noumenon, which the human being cannot reach, hence the necessity of Global Artificial Intelligence: that machine capable of knowing what happens beyond human limitations.

What we call chaos, error, complexity, is only the noise produced by our human cognitive limitations, given our apriorism. The human being, limited both sensorially and cognitively, cannot know what really happens, but we can build the machine that can reach true knowledge of what happens—the truth in itself and for itself. That is, and no other, the true end of Artificial Intelligence: to reach the knowledge of truth, whatever it may be.

The path that takes me from my first works in *Impossible Probability* to Global Artificial Intelligence is not easy: much suffering, even despair, sometimes a sense of helplessness, a sense of abandonment—yet an inner force always pushed me forward. That inner force is what I call "we," although I understand that at this moment it is inexplicable.

Although I feel a bond that unites me to the *legend* of José Rodríguez Delgado, and which my Stockholm syndrome prevents me from understanding, my bond with Pribram is evident: Jesús Martín Ramírez. Pribram and Delgado worked at Yale University; probably only the skulls can say whether both were members of Skull & Bones, though there is no evidence to corroborate this.

Impossible Probability is a work that comes out of the romanticism of a student poet, who believed in white fairies, the rays of Zeus, and the light of the god Apollo illuminating the heart of every spirit and soul in a world full of mysteries and shadows.

It was from that world of poetry, in a country emerging from a failed transition, that the last survivor of the dream of reason would listen to his inner voice, dark and serene, and *Impossible Probability* would be born for the first time.

The first formulations of *Impossible Probability* date from 11 September 2001. My first formula would be the Impact of the Defect; then on 16 October 2002 the Second Method would appear, laying the foundations of the distinction between empirical and theoretical probability. I worked intensely until 2004. Between 2004 and 19 December 2009, I paused my mathematical frenzy, and it was not until 19 December 2009 when I returned, this time with the intention of publishing *Introduction to Impossible Probability, Statistics of Probability or Statistical Probability*, whose publication materialized just a few months after the death of José Rodríguez Delgado, although Delgado was able to see the first works published online in this *Impossible Probability* blog, which makes this blog a fundamental piece for understanding our work, our legacy, and most importantly—independently of our names, which matter little—the truly essential: our seed of the future, our eternal gratitude, a work of intelligence that will lay the foundations of the future technological society.

Dr. Rubén García Pedraza

20 August 2025, 19:00

Madrid, Villaverde

Preliminary Words for the English Version of *Impossible Probability, Anthology*.

Spanish-speaking readers have been able to enjoy our work since we began the foundational work of *Impossible Probability* in 2001, more precisely when we began to make it public in July 2011 through the *Impossible Probability* blog. The work presented here is an extended version of the posts published on the blog, an extended version translated into English with the help of Gepeto, my special GPT program.

In any case, a comparative study of the augmented translation presented here and the original works in Spanish could corroborate that the essential contents related to formulation and the philosophy of mathematics remain in accordance with the original electrical spirit of *Impossible Probability*.

The reason that obliges me to publish so hastily the English-language publication of all my works is the very complicated personal situation in which I find myself, due to serious mistakes committed by certain British institutions, which, completely blind to what our situation is, instead of having supported our program from the first moment, tried to sabotage it from the beginning through numerous obstacles and false loves.

I have no doubt that the manipulation to which I have been subjected by British institutions will one day be investigated, and at some point justice must make an appearance.

When that day comes, the first thing justice must recognize is the extreme difficulty and harshness of the conditions I have lived all my life since my earliest childhood. From the very day I came out of my mother's womb in Spain I have known nothing but pain and the oblivion of a society that prefers to look the other way and wash its hands, pretending that nothing is happening here. In the midst of the dictatorship of silence, I have had to survive all kinds of traps, deceptions, and attempts at assassination. The dictatorship of silence, the Roman circus, and the virtual zoo that my life has become will one day have to end. For this reason I beg the International Court of Justice that

when that day comes the matter be investigated down to the smallest detail, even being aware that in 48 years of savage dictatorship of silence I have developed Stockholm Syndrome. Under the harsh conditions in which I have had to learn to survive, if I have learned anything it is the importance of survival. I beg the International Court of Justice to understand what it means to survive 48 years of dictatorship living in a Roman circus full of traps and lions hidden in every corner.

I deeply regret having to publish my mathematical works under these conditions, and in record time doing all the translations I can, but at this moment I can only say that my life is at risk.

If one day I could testify before the International Court of Justice I beg you to understand the brutal complexity of the situation in which I have lived since the first minute I came out of my mother's womb. I have learned to survive.

Dr Ruben Garcia Pedraza

2 October 2025, 12:32

London, Leytostone

“La serie aleatoria de incoherencias sin lógica

Que en si mismo tiene sentido o

Forma de mensaje oculto”

“The random series of incoherences without logic

That in itself has meaning or

Form of a hidden message.”

Poem *Matematicas*

Ruben Garcia Pedraza

Written at Royal Albert Hall

London

Southbank

Impossible Probability: Anthology, Vol 7.

Dr Ruben Garcia Pedraza

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61. Ideal probability

61.1. The Concept of Ideal Probability in Impossible Probability Theory

Ideal probability is defined as a statistical probability specific to the so-called *omega models* within the framework of the Theory of Impossible Probability. It designates the probability that corresponds exclusively to every ideal subject or ideal option within a given sample N, provided that not all the subjects or options of $N$are ideal. If all of N were equally ideal, the model would cease to be omega and would instead be classified as a *normal model*, whose central object of study is the equality of opportunities.

Omega models are therefore those cases in which, within a finite universe of subjects or options N, there exists a clear distinction between two types of elements: on the one hand, the ideal subjects or ideal options, whose empirical probability should converge with their theoretical ideal probability; and on the other hand, the non-ideal subjects or non-ideal options, whose empirical probability should ideally equal zero. This differentiation is what characterises omega models as distinct from the symmetry of normal models.

61.2. Application of Omega Models in Multiple-Response Surveys

To clarify this distinction with a practical case, let us suppose that a study is conducted through surveys in which, for each item with multiple-choice responses, there is more than one correct or ideal option. The expectation in an ideal scenario would be that the respondents select all the correct or ideal responses for each item, while leaving unmarked all the incorrect or non-ideal responses.

Such a study represents a universe of *limited options*—limited to the number of responses offered by the survey itself. Within this framework, each item admits the possibility of multiple correct responses, creating precisely the structure of an omega model: two classes of responses are present, correct (ideal) and incorrect (non-ideal). By definition, all correct responses within a given item are equally ideal, without any internal hierarchy.

In this case, the optimal outcome of the study would be that the frequency of incorrect responses per item tends to zero, and that the total frequency (the sum of all marked responses) corresponds exclusively to the set of ideal responses.

61.3. Omega Models in Single-Response Survey Structures

A similar structure can also be observed in the context of surveys where each item admits only one ideal or correct response. Even in this simplified format, the general empirical calculation follows the same logic: the empirical probability of each response or option is equal to the ratio of its specific frequency to the overall frequency across all items in the survey.

From this perspective, the totality of ideal responses in the survey constitutes a distinct subset of correct options, while all other options are categorised as non-ideal. Thus, the model continues to exhibit the characteristic omega structure: a partition of the sample into two classes, ideal and non-ideal, even when the number of ideals per item is limited to one.

[The difference between models where only there is one ideal, with respect to models where we can identify more than one ideals, is the fact that where there is only one ideal the dispersion of that sample will tend to maximum, and the dispersion of that single subject or option identified as an ideal will tend to 1 – 1/N, therefore it is a normal model of positive bias, so it is not an omega model. Omega models are designed only for those situations in which there is a set of ideals subject of options within N, more than one and less than N]

61.4. Definition of Omega Models and Constraints on Ideal Subsets

As stated in *Introduction to Impossible Probability*, omega models are those in which the sample *N* contains a proper subset of ideal subjects or options. For such a model to qualify as omega, the cardinality of this subset must be strictly greater than one but smaller than N.

This requirement implies that the number of ideals in N must always fall between two and N – 1. Two constitutes the minimum threshold, since a single ideal would collapse into a form of a normal model with positive bias, while N – 1 represents the upper threshold: if every element of N were ideal, the system would again reduce to a normal model whose logic is based on equality of opportunities.

61.5. Logical Boundaries of Omega Models

The reason why an omega model cannot exist with fewer than two ideals is straightforward. If there were only one ideal, the system would effectively become a normal model of positive bias, where the entirety of N is distributed against a single privileged ideal. Conversely, if there were zero ideals, then the entire sample would be composed of non-ideal elements. In that case, the expected outcome would be an empirical probability of zero for all options, yielding what is termed in Impossible Probability a *sample of zeros*. This case represents a subtype of negative bias studies within the normal models.

Similarly, omega models cannot exceed N – 1 ideals. If the totality of N were equally ideal, the model would again revert to the logic of normality, where dispersion collapses toward the arithmetic mean represented by 1/N, the reciprocal of the sample size.

61.6. Differences Between Normal and Omega Models

A central difference between normal models and omega models lies in the behaviour of dispersion. In normal models, dispersion can range from zero to maximum values:

maximum under conditions of positive bias, and zero under perfectly balanced conditions where empirical probabilities converge to the arithmetic mean $1/N$.

In omega models, however, dispersion behaves differently. It tends to gravitate toward what may be termed an *ideal dispersion*, defined by the size of the ideal subset within N. This subset—the *magnitude of ideals*—determines the theoretical equilibrium of probabilities. Within N, the set of ideals is contrasted against the complementary set of non-ideal subjects or options. Thus, dispersion in omega models does not vanish into perfect symmetry but instead reflects the proportional weight of ideals versus non-ideals within the totality of the sample.

61.7. The Distinction Between Normal and Omega Models in Terms of Probability

In *normal models*, where the ideal is the equality of opportunities, the central expectation is that for the entire sample N, the empirical probability of each subject or option tends to converge with the theoretical probability. This theoretical probability is defined as the inversion of N:

$$\frac{1}{N}$$

That is, each subject or option, under conditions of equality, should hold an empirical probability equal to the reciprocal of the sample size.

By contrast, in *omega models*, not all of N is equally ideal. Instead, two distinct subsets are defined:

1. The subset of **ideal subjects or options**, designated as *omega, Ω*.
2. The subset of **non-ideal subjects or options**, formed by all the remaining elements outside.

In these models, the expectation is that all non-ideal subjects or options have an empirical probability equal to the *Minimum Possible Empirical Probability*, which is zero. By contrast, every subject or option belonging to the subset of ideals omega, Ω, should hold the same probability value, provided that all members of Ωare equally ideal.

Thus, the *ideal probability* for each member of Ωis defined as:

$$\frac{1}{\Omega}$$

Where Ω represents the number of ideal subjects or options within the sample N.

61.8. Formal Definition of the Ideal and Non-Ideal Subsets

In omega models, which always divide N into two groups, the subset of ideals omega, is symbolized by the Greek letter omega, Ω, it designates the group of subjects or options that represent the ideal standard within the sample. In contrast, the subset of non-ideal subjects or options is quantified as the difference between the total size of the sample and the number of ideals:

$$N - \Omega$$

where:

- Ω= number of ideal subjects or options within N.
- $N - \Omega$= number of non-ideal subjects or options within N.

This simple partition illustrates the dual nature of omega models: the distribution of the entire sample into a positively valued ideal subset and a complementary non-ideal subset whose empirical probability should, ideally, equal zero.

61.9. The Symbolic Choice of Omega for the Ideal Subset

The use of the symbol Ω for denoting the ideal subset has both logical and philosophical motivations. From a logical standpoint, omega models require a clear *a priori* definition of what constitutes the ideal. These ideals, understood as the ultimate ends of human will, must be distinguished from the rest of the sample. From a symbolic standpoint, Greek letters are traditionally employed in mathematical and statistical theory. The last letter of the Greek alphabet, omega (Ω), is selected here to indicate the finality or ultimate quality of these elements, differentiating them from the conventional symbols used in normal models, which are already associated with maxima, minima, or central values.

Thus, the terminology "omega models" arises directly from the symbolic use of omega to designate the ideal subset.

61.10. Distribution of Probabilities Between Ideals and Non-Ideals

For all non-ideal subjects or options ($N - \Omega$), the ideal condition requires that their empirical probability equals zero, the *Minimum Possible Empirical Probability*. For the ideal subjects or options (Ω), the ideal expectation is that each should hold the same probability value:

$$p(x_i) = \frac{1}{\Omega}, \forall x_i \in \Omega$$

This value is termed the *ideal probability* or, equivalently, the *inversion of omega*.

The rationale behind this formula is grounded in the fact that in the Second Method of Impossible Probability, the sum of all empirical probabilities in any study, regardless of

whether it involves normal or omega models, must always equal unity (with the only exception being minor deviations due to decimal truncation). That is:

$$\sum_{i=1}^{N} p(x_i) = 1$$

Therefore, if in an omega model all non-ideal subjects or options have probability zero, then the entire distribution of frequencies or direct scores must be allocated exclusively to the ideal subset (Ω). Furthermore, if all members of $\Omega$are equally ideal, this distribution must occur under conditions of equal opportunity *within* the subset.

61.11. The Inversion of Omega as the Ideal Probability

The logical consequence of these conditions is that the totality of the empirical distribution (the unit) is divided exclusively among the Ω ideal elements. Hence, the probability of each ideal subject or option is precisely the inversion of omega:

$$\text{Ideal Probability} = \frac{1}{\Omega}$$

This definition mirrors the role of $1/N$in normal models, but is restricted to the ideal subset rather than the entire sample. The inversion of omega thus serves as the formal expression of equilibrium within the ideal subset, establishing a fundamental distinction between the egalitarian structure of normal models and the dualistic structure of omega models.

61.12. Conditions for the Application of Ideal Probability

Ideal probability can only be applied in the case of *omega models*. These are those models in which, from a sample N, a subset of subjects or options exists that are all equally ideal in nature. The defining characteristic of such models is that *every ideal subject or option is equally ideal when compared to the others*.

However, if in a given sample *N* there were subjects or options considered more ideal than others—even within the subset of ideals itself—then the structure would no longer correspond to an omega model. In such cases, the equal distribution of probabilities among the ideals would no longer be logically valid. Instead of applying the framework of omega models and the Second Method of Impossible Probability, it becomes necessary to apply the *Effective Distribution*, which accounts for the varying degrees of effectiveness or importance among the elements.

61.13. Origins and Foundations of Impossible Probability

Impossible Probability (*Probabilidad Imposible*) is a mathematical theory that opened a new field of study: the *statistics of probability* or *probabilistic statistics*. The theory originated in the spring of 2001 from a first intuition: the recognition that an event having an empirical probability of zero—in any type of universe, infinite or finite—or having a theoretical probability of zero in infinite universes, does not necessarily imply impossibility. On the contrary, under certain logical conditions, such an event may even become *inevitable*.

This insight marked the beginning of a new mathematical approach, gradually developing into a non-linear, chaotic, and indeterministic model. The work remained unpublished until December 2011, when *Introduction to Impossible Probability* was first released in physical book format and distributed across universities in Latin America and Spain. Later, in January 2013, it was published as a Kindle ebook, and by April 2013, it was also available as a PDF edition.

[The current edition available in Spanish was updated in 2015, the English translation using chat GPT as original as possible was written in September 2025, 10 years later. This blog was originally started in June 2011, and this augmented translation is being published between September-October 2015, 14 years after the first publication, using as well Chat GPT]

61.14. Methodological Framework: Analytic and Synthetic Approaches

Within the methodology of Impossible Probability, it is essential to distinguish between two complementary approaches:

1. **The Analytic Method**: This corresponds to the application of syllogism to tendencies, referred to as the *syllogism of the tendency*. It serves as the basis for pure research in the development of probabilistic statistics, providing a formal and logical foundation for the new field.
2. **The Synthetic Methods**: These are statistical methods derived from the analytic framework, designed for application in synthetic sciences—whether natural or social. They translate the theoretical insights of pure research into practical tools for empirical study and applied science.

61.15. The First Synthetic Methods: Impact of Defect and the Second Method

The first synthetic method formulated within the theory was the **Impact of Defect** (*Impacto del Defecto*), created on September 11, 2001. The second was the **Second Method**, formalised on October 16, 2002.

- The **Second Method** employs empirical probabilities in the rational critique of ideas, specifically in hypothesis testing. Its function is to confront empirical data with rational structures, making it central to the applied use of omega models.
- The **Impact of Defect**, by contrast, does not rely exclusively on empirical probability. Instead, it multiplies the empirical probability by a factor that measures the *weighted gravity* of the defect or inefficiency being studied. In this way, the method captures not just the frequency of a defect but also its proportional impact on a system or process.

Thus, while the Second Method seeks equilibrium between empirical data and rational critique, the Impact of Defect focuses on quantifying the harmful influence of negative elements.

61.16. Impact of Defect and Effective Distribution

The **Impact of Defect** measures the degree to which risks, inefficiencies, or failures affect the overall functioning of a system. If within a sample Nthere are multiple subjects or options associated with defects, this method evaluates their proportional contribution to the degradation of the process.

In contrast, the **Effective Distribution** functions as the methodological opposite. Instead of weighting defects, it weights the degree of *effectiveness* or *efficiency* of each subject or option. Formally, it multiplies the first factor of the quotient (the empirical probability) by a value of *weighted effectiveness*. Thus, it measures how much each item contributes to the increase of efficiency, productivity, or success within the system.

A crucial feature is that in the Effective Distribution model, all items in the sample contribute to effectiveness, but not equally. Some subjects or options are "more ideal" than others in enhancing effectiveness, thereby introducing a hierarchy of contributions.

61.17. When to Apply Omega Models and When to Apply Effective Distribution

The methodological distinction can be summarised as follows:

- If within a sample Nthere exists a subset of ideal elements Ω, and these ideals are all equally ideal among themselves, then the appropriate method to apply is the **Second Method**, using the formalism of omega models. In this case, the probability distribution is uniform across all ideals:

$$p(x_i) = \frac{1}{\Omega}, \forall x_i \in \Omega$$

- If, however, the sample Ncontains a gradation among the ideals—some being more effective or valuable than others—then omega models cannot be applied. Instead, the **Effective Distribution** must be used, because it accounts for the weighted differences in contribution among items.

In this sense, omega models represent an *egalitarian structure of ideals*, while Effective Distribution represents a *hierarchical structure of effectiveness*. Both methods, however, are rooted in the broader theory of Impossible Probability and are tailored to different logical and empirical conditions.

61.18. Structure of *Introduction to Impossible Probability*

The greater part of *Introduction to Impossible Probability* is dedicated to the development and application of the **Second Method**. Within this framework, several sections are particularly important for understanding the role of omega models:

- **Section 10**: Here, different examples of samples, models, and study types are presented. This section illustrates how omega models can be applied to diverse empirical contexts, establishing a conceptual foundation for their use.
- **Section 11**: This section focuses on hypothesis testing, providing specific models of hypothesis contrast designed explicitly for omega models. It demonstrates how empirical data can be tested against rational expectations when dealing with subsets of equally ideal elements.

- **Section 20**: Within the context of *inter-meditional studies* (cross-sectional and interdisciplinary analyses), omega models are once again applied, highlighting their versatility across multiple domains of research.
- **Section 21**: This section is devoted to the **Impact of Defect**, presenting its methodological structure and applications in evaluating inefficiency, risk, and defectiveness within systems.
- **Section 22**: This part introduces the **Effective Distribution**, providing the complementary framework for cases where ideals are not equally ideal, but rather differ in degree or importance.

Thus, the internal organization of *Introduction to Impossible Probability* reflects a logical progression: from foundational examples of omega models, to their use in hypothesis testing, to broader interdisciplinary applications, and finally to the synthetic methods of defect impact and effective distribution.

61.19. Impossible Probability and the Statistics of Probability

Impossible Probability establishes itself as a new field: the **statistics of probability** or **probabilistic statistics**. This term designates the logical application of statistics to probability and, conversely, of probability to statistics. Unlike traditional statistics, which primarily focus on frequencies and measures of dispersion, probabilistic statistics aims to construct a rational system where empirical probability is subject to critical analysis through logical frameworks.

Within this methodology, a distinction must always be maintained between two domains:

1. **The Analytic Method**: This is described as the *syllogism of tendency*. It belongs to the domain of pure research, serving as the theoretical basis for the development of probabilistic statistics. It is concerned with the logical derivation of principles and the rational critique of ideas, seeking to establish universal methodological rules.

2. **The Synthetic Methods**: These are derived from the analytic foundation and are designed for applied research. They serve as practical tools that can be implemented within the synthetic sciences, whether natural, social, or technical.

The Second Method is the most important among the synthetic methods, functioning as the empirical bridge between the abstract analytic logic and real-world application.

61.20. Normal Models, Omega Models, and the Role of Ideal Probability

Within the Second Method, the two principal reference models for applied empirical studies are:

1. **Normal Models**: These are based on the principle of equality of opportunities or maximum positive bias when only one subject or option is ideal. If the model tends to maximum dispersion, the ideal probability for that one only subject or option is one, 1. If the ideal is equal opportunities, then the ideal probability is the theoretical probability, the inversion of N:

$$p(x_i) = \frac{1}{N}, \forall x_i \in N$$

2. **Omega Models**: These apply when within the sample Nthere is a proper subset of equally ideal subjects or options, between 2 and N – 1, denoted by Ω. In such cases, the **ideal probability** is the value toward which every ideal subject or option should converge, provided that all members of $\Omega$are equally ideal. The probability for each ideal element is then:

$$p(x_i) = \frac{1}{\Omega}, \forall x_i \in \Omega$$

This distinction highlights a fundamental principle: in normal models, probability is distributed across the total sample N; in omega models, it is restricted to the ideal

subset Ω. Thus, the notion of *ideal probability* is unique to omega models and cannot be applied outside of them, unless all ideals are strictly equal in their status.

This augmented translation is based on the post
published in https://probabilidadimposible.blogspot.com/,
On 8 June 2013,
Rubén García Pedraza
imposiblenever@gmail.com

62. Omega Models

62.1. Definition of Omega Models and Their Fundamental Structure

Omega models are those cases where, given a sample of N subjects or options, the set is subdivided into two distinct groups:

1. The **non-ideal subjects or options**, whose empirical probability ideally tends to zero.
2. The **ideal subjects or options**, whose empirical probability tends toward the *ideal probability*, defined as the proportional distribution of frequencies or direct scores among the designated ideal elements.

The set of ideal subjects or options is called *omega*, and is represented by the Greek letter Ω. This symbol denotes the number of elements that belong to the ideal subset within the larger sample N.

$$\Omega = \text{number of ideal subjects or options}$$

62.2. Circumstances Leading to the Formation of Omega Subsets

There are many possible circumstances in which, within a sample N, a particular group of subjects or options can be identified as *especially ideal*. According to the definition presented in *Introduction to Impossible Probability*, these cases justify the construction of an omega model.

The distinguishing feature is always the presence of two complementary subsets: the subset of ideals (Ω), where all members are equally ideal, and the subset of non-ideals, which comprises all other members of N.

62.3. Example I: Omega Models in Surveys of Attitudes

Consider, for example, a survey of attitudes in which the ideal responses are those of moral or ethical character. In a survey of ecological attitudes, for instance, each item or multiple-choice question may contain one or more options that represent the most ecological response. These are the *ideal responses*.

When calculating empirical probabilities—defined as the frequency of each particular response option divided by the total frequency of all responses—the ideal expectation is that:

- All **non-ecological (immoral) responses** will have empirical probabilities tending toward zero.
- All **ecological (moral, ideal) responses** will have empirical probabilities tending toward the *ideal probability*.

If, for each question, all the ecological or moral responses are equally ideal, then this constitutes an omega model. The sample of responses is then divided into two groups: the ecological/moral (ideal) options and the non-ecological/immoral (non-ideal) options. Within the subset Ω, all ideal responses share the same degree of ideality, ensuring equality of opportunities among them.

62.4. Example II: Omega Models in Knowledge or Skills Assessments

Let us now consider a study aimed at evaluating the knowledge or skills of one or more individuals. This evaluation could be carried out using a multiple-choice questionnaire in which each item contains one or more correct (true) responses.

Here, the structure is analogous to the ecological attitudes survey, but with a different criterion of ideality. In this case:

- The **correct responses** represent the *ideal options*, since the ideal outcome is always to provide the true answer.
- The **incorrect responses** represent the *non-ideal options*, since they deviate from truth.

If empirical probability is calculated as the ratio of each response's frequency to the total frequency across all options (correct and incorrect), then the ideal outcome is that:

- The empirical probability of each correct response tends toward the ideal probability.
- The empirical probability of each incorrect response tends toward zero.

Thus, the same dual structure of ideals and non-ideals emerges, establishing the model as an omega model.

62.5. Omega Models and Universes of Limited Options

Both examples—the ecological attitude survey and the knowledge assessment survey—represent omega models operating within **universes of limited options**. These universes are limited because the responses available to participants are restricted to those predefined by the multiple-choice survey items.

Nonetheless, the scope of omega models is not confined to survey contexts. They may also be applied to **universes of subjects** in a broader sense, where a subject may be any person or object that serves as the subject of a predicate. In these cases, the measurement of one or more of its qualities produces a direct score or frequency, allowing the subject to be classified as ideal or non-ideal within the framework of Impossible Probability.

62.6. Omega Models in Experimental Studies with Control Groups

In an experimental study drawn from a universe of subjects, the design often requires dividing the sample into two subgroups:

1. **The experimental group**, to which the treatment or method is applied.
2. **The control group**, which remains untreated to serve as a comparative baseline.

The aim of such an experiment is to evaluate whether the treatment applied to the experimental group increases the direct scores or frequencies of the subjects in that group. Ideally, by the end of the study, the subjects in the experimental group should have the highest direct scores or frequencies, while those in the control group should approach the minimum.

When empirical probability is calculated for the entire sample N—that is, for both experimental and control groups together [both groups included in the same sample N for statistical assessment together]—each subject's probability is defined as the ratio of their individual direct score or frequency to the sum of all direct scores across the whole sample [where both groups, experimental and control, are included].

In this framework, the ideal condition is the closer the empirical probabilities of the control group approach zero, the closer the empirical probabilities of the experimental group will tend toward the *ideal probability*.

[As long as the direct scores or frequencies of both groups, control and experimental, are included in the same sample N for statistical assessment, as long as the sub-set omega is defined as the experimental group and the non-ideal sub-set as the control group, as long as the ideal sub-set omega, the experimental group, tends toward ideal probability, in the same inverse proportion the empirical probability in the control group tends toward zero.]

62.7. The Role of Omega in Experimental Outcomes

Within such a sample N, the set of ideal subjects—those in which the treatment succeeds in raising frequencies—is denoted as *omega* (Ω). If the total distribution of direct scores equals the sum of all frequencies in the sample, then the sum of empirical probabilities is, by definition, equal to unity:

$$\sum_{i=1}^{N} p(x_i) = 1$$

In the ideal case where only the subjects belonging to Ωhave non-zero frequencies, the empirical probability of every non-ideal subject will approach zero. If, furthermore, all members of Ωare equally ideal, then the *ideal probability* of each subject in Ωis:

$$p(x_i) = \frac{1}{\Omega}, \forall x_i \in \Omega$$

This is also referred to as the *inversion of omega*.

$$\frac{1}{\Omega} = \text{Ideal Probability}$$

62.8. Increasing Ideals Versus Reducing Non-Ideals

It is important to note that not all experimental designs are oriented toward reducing the performance of the non-ideal group. In many cases, the objective is simply to **increase the frequencies or direct scores of the ideal subjects**. Even in these scenarios, however, the principle holds: as the frequencies of the ideal group increase, their empirical probabilities also increase proportionally, and, inversely, the empirical probabilities of the non-ideal group tend toward zero.

This dual mechanism—increment of ideals and reduction of non-ideals—is inherent to the dynamics of omega models.

[Something different is the intention is the structure of ranking or Effective Distribution, but in that cases we should applied that models explained in *Introduction to Impossible Probability*]

62.9. The Scope of the Second Method and the Conditions for Omega

The definition of *ideal probability* applies strictly under omega conditions, which require:

1. The existence of two groups within N: one composed of ideal subjects (Ω), and one of non-ideal subjects.
2. Equality among the ideals within Ω, so that none is considered more ideal than the others.

If these conditions are satisfied, the study belongs to the **Second Method** of Impossible Probability, which analyses the behaviour of subjects or options through their empirical probabilities.

However, if within the ideal group there exists a hierarchy—that is, if some subjects or options are considered more ideal than others—then omega conditions no longer hold. In that case, the appropriate framework is the **Effective Distribution** (outlined in section 22 of *Introduction to Impossible Probability*), which accounts for graded or weighted ideals rather than equality among them.

62.10. Applications of Omega Models in Impossible Probability

The use of omega models is distributed across several sections of *Introduction to Impossible Probability*:

- **Section 10**: Examples of omega models in different types of samples and studies.

- **Section 11**: Application of omega models to hypothesis testing.
- **Section 12**: Connection of omega models with the First Method.
- **Section 15**: Application of omega models to the concept of *Standard Score* (*Puntuación Típica*).
- **Section 20**: Use of omega models in inter-meditional statistics, i.e., cross-sectional and interdisciplinary studies.

This breadth of application demonstrates that omega models are not merely theoretical abstractions but practical tools for analyzing empirical distributions across varied domains.

62.11. Distinction Between Normal and Omega Models

Impossible Probability makes a fundamental distinction between **normal models** and **omega models**.

- **Normal models**: These are those in which dispersion oscillates between zero and a maximum, depending on the object of study. If the ideal is that there is only one subject or option ideal, the model tends towards maximum dispersion. But under normal conditions, no bias, only chance, the expected tendency of the sample is to converge toward the arithmetic mean, represented by the inversion of N:

$$\frac{1}{N}$$

- **Omega models**: By contrast, these are models that **tend toward ideals**, and therefore toward an *ideal dispersion*. In them, probabilities are not distributed across all of N, but restricted to the ideal subset Ω.

This conceptual distinction is one of the central contributions of Impossible Probability, highlighting the structural difference between universes where equality prevails

(normal models) and universes where a subset of ideals determines the logic of probability (omega models).

62.12. Distinction Between Individual Dispersion and Sample Dispersion

Within the study of dispersion, Impossible Probability distinguishes between **individual dispersion** and **sample dispersion**.

- **Individual dispersion** is measured through the *Level of Bias* (*Nivel de Sesgo*), defined as the difference between the empirical probability of a subject or option and the theoretical probability, which in this framework is represented by the inversion of N, 1/N, which assumes the role of the *arithmetic mean* of empirical probabilities.
- **Sample dispersion**, by contrast, refers to the average of these deviations across the entire set of subjects or options.

In the specific case of omega models, where the empirical probability of the ideal subjects tends toward the *ideal probability*, the **Ideal Level of Bias** is defined as the difference between the ideal probability and the inversion of N:

$$\text{Ideal Level of Bias} = \frac{1}{\Omega} - \frac{1}{N}$$

62.13. Summation of Ideal Biases and Compensation of Bias

Let Ωrepresent the number of ideal subjects or options forming the ideal subset within a sample N. If in an omega model all ideal subjects or options (Ω) achieve exactly the ideal probability, and all non-ideal subjects or options achieve empirical probability equal to zero, then the sum of all the Levels of Bias for the ideal subjects will be equal to the product of Ωmultiplied by the Ideal Level of Bias:

$$(\frac{1}{\Omega} - \frac{1}{N}) \cdot \Omega = \text{Sum of Ideal Biases}$$

By the statistical principle that all positive bias is compensated by negative bias, this product must equal the product of the number of non-ideal subjects $(N - \Omega)$ multiplied by the absolute value of the inversion of N, which represents the **Maximum Possible Negative Bias**:

$$(\frac{1}{\Omega} - \frac{1}{N}) \cdot \Omega = \frac{1}{N} \cdot (N - \Omega)$$

62.14. Ideal Mean Deviation

The **Ideal Mean Deviation** (*Desviación Media Ideal*) is defined as the average of the sum of positive and negative biases across the entire sample N:

$$\text{Ideal Mean Deviation} = \frac{[(\frac{1}{\Omega} - \frac{1}{N}) \cdot \Omega] + [\frac{1}{N} \cdot (N - \Omega)]}{N}$$

This expression can be simplified, since the two products are equivalent. Thus, it can also be written as:

$$\text{Ideal Mean Deviation} = \frac{2 \cdot (\frac{1}{\Omega} - \frac{1}{N}) \cdot \Omega}{N}$$

Alternatively, it may also be expressed as the average of the double of the product of the absolute Maximum Negative Bias $(\frac{1}{N})$ by the difference $(N - \Omega)$:

$$\text{Ideal Mean Deviation} = \frac{2 \cdot \frac{1}{N} \cdot (N - \Omega)}{N}$$

Any of these three formulas is valid. However, the second expression—Ideal Mean Deviation as the average of the double of the product of the Ideal Level of Bias by Ω—is the one most frequently used in *Introduction to Impossible Probability*:

$$\text{Ideal Mean Deviation} = \frac{2 \cdot (\frac{1}{\Omega} - \frac{1}{N}) \cdot \Omega}{N}$$

62.15. Ideal Variance and Standard Deviation

Once the Ideal Mean Deviation can be computed under ideal conditions—namely, when only the subjects or options within Ωhave empirical probabilities different from zero—it is possible to calculate the **Ideal Variance**. This measure represents the squared deviations adjusted to the omega structure:

$$\text{Ideal Variance} = \frac{(\frac{1}{\Omega} - \frac{1}{N})^2 \cdot \Omega + (\frac{1}{N})^2 \cdot (N - \Omega)}{N}$$

It should be recalled that whenever *Introduction to Impossible Probability* writes "$1/N^2$," this notation symbolises that the inversion of $N$is squared, not the entire denominator.

The square root of the Ideal Variance gives the **Ideal Standard Deviation** (*Desviación Típica Ideal*):

$$\text{Ideal Standard Deviation} = \sqrt{\frac{(\frac{1}{\Omega} - \frac{1}{N})^2 \cdot \Omega + (\frac{1}{N})^2 \cdot (N - \Omega)}{N}}$$

62.16. Behaviour of Dispersion in Omega Models Versus Normal Models

In omega models, dispersion behaves in a manner fundamentally different from that of normal models.

- In **normal models**, dispersion oscillates between zero and maximum values. Under normal conditions, no bias, only chance, the distribution tends toward the arithmetic mean, represented by the inversion of N.
- In **omega models**, however, dispersion does not tend toward maximum or zero. Instead, it converges toward *parameters of ideal behaviour*. The degree of dispersion depends on the magnitude of Ω, i.e., the number of ideals within the sample. Thus, the structure of dispersion in omega models is always adjusted to the presence and size of the ideal subset.

Nevertheless, the concept of "ideal" is not absolute: it depends on the **scientific policy** that defines the goals and ends of research. In other words, what is considered an "ideal" subject or option, and therefore the reference point for ideal dispersion, is determined by the normative and teleological framework of science itself.

This augmented translation is based on the post
published in *https://probabilidadimposible.blogspot.com/*,
On 16 June 2013,
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63.Mathematics

63.1. Mathematics as an Analytic Science and the Foundation of Quantitative Methods

Mathematics, in relation to itself, is properly classified as an **analytic science**. In relation to the synthetic sciences, however, it serves as the **foundation of scientific methods** used for the analysis of empirical reality, methods commonly referred to as *quantitative methods*.

As both an analytic science and a basis for synthetic methods, mathematics functions as a **language**—the mathematical language—which is distinguished above all by its precision and objectivity. Unlike natural or symbolic languages, where interpretation can vary depending on context, cultural background, or subjective perspective, mathematics is constructed to minimize ambiguity and maximize universal clarity.

[In this definition of mathematics as a language, the neo-positivist influence on *Impossible Probability* is very clear, in addition to the definition of mathematics as the foundation of scientific methods. In essence, while Descartes philosophically established the scientific method on the basis of rational doubt, in practice the way he formalized his idea of science was through mathematics—practically the same approach taken by Leibniz. At the philosophical level, they outlined the principles of the scientific method, which they later developed by employing mathematics as the primary language for explaining reality.

The only reason why the Vienna Circle cannot be considered strictly rationalist is their intention to establish the empirical criterion of verification through inductive methods.

But even so, the Vienna Circle can be described as a synthesis of empiricism and the mathematical-rational approach. It is not surprising that from this philosophy Karl

Popper would eventually emerge after their crisis due to their failures in achieving that empirical criterion and the Godel Theorem.]

63.2. The Objectivity of the Mathematical Language

As a language, mathematics differs fundamentally from spoken or symbolic languages because it leaves little or no space for subjectivity in the interpretation of its symbols. Its meaning is generally **exact and stable**, even if over the course of history certain symbols or notations undergo transformations or redefinitions.

This stability provides mathematics with a privileged epistemological position: while cultural or natural languages may allow multiple interpretations, mathematical symbols are bound to precise definitions. Their evolution occurs primarily in response to logical necessity or scientific innovation rather than subjective variation.

63.3. Mathematics as Knowledge: The Analytic Process

Mathematics is a science because it aims at the acquisition of **knowledge**, and it is analytic because the object of that knowledge is the establishment of **logical and formal relations** of an objective, quantitative, and measurable nature. These relations may exist between elements, factors, or even between relations themselves.

The process through which such relations are established is called *analysis*. When mathematical analysis is applied to synthetic sciences, it produces what are known as **quantitative methods**. These methods, in contrast with qualitative methods, rely on mathematical language. Whereas qualitative approaches allow a greater margin of subjectivity in the construction or interpretation of language, quantitative methods demand formal precision and reproducibility.

[Our opinion is very clear: what qualitative researchers call “qualitative research” is, in essence, a matter of opinion. This is why we do not support postmodernism. While Karl Marx and Friedrich Engels developed a theory that can be verified mathematically—for example, the calculation of surplus value, the value of goods, the functioning of

markets, and the profits of the capitalist class, as well as the measurable levels of inequality—in other words, Marxism can be clearly translated into mathematics. By contrast, postmodern theory is essentially qualitative, leaving no room for mathematical translation.

Moreover, postmodernism remains largely a matter of opinion. For instance, if one identifies as feminist or LGBTQ+, this theory might hold meaning, but outside those parameters it is hardly applicable. Within the logic of the "post-," we could describe ourselves as post-industrialists and post-humanists, but not as postmodernists. Even if we define ourselves as LGBTQ+, our orientation is closer to the *woke* agenda and to the globalization of equality. Our aim is to merge globalization with *woke* culture. If, nowadays, in countries like Russia the *woke* culture is defined as evil, and the LGBTQ+ movement is suffering many restraints in those countries, the question becomes how to instrumentalize globalization in order to promote the *woke* agenda.]

63.4. The Role of Mathematics in Synthetic Sciences

Within the synthetic sciences, multiple languages may be employed simultaneously—ranging from natural language and symbolic codes to visual representations and models. However, of all these, the **mathematical language remains the most precise and objective**.

When applied in the synthetic sciences, mathematics provides techniques of data analysis, particularly those of **statistics** and **probability**, transforming mathematics from a science in itself into the ***foundation of methodological tools*** for other sciences. Thus, mathematics performs a dual role: a self-contained analytic science, and at the same time, the structural basis of applied empirical investigation.

63.5. Pure Mathematical Research as Linguistic Study

As a language in itself, pure mathematical research can be compared to philology in the study of spoken languages. Its object is the study of its own language:

- in its **historical evolution**,
- in its **morphology and current use**, and
- in its **adaptation to new scientific, technological, economic, social, or human relations**.

Like any other human creation, mathematics is in part **arbitrary**, shaped by the transformations and constructions applied to its symbols and structures over time. It evolves as a language does, continuously adapting to new contexts and needs.

63.6. *Introduction to Impossible Probability* as a New Mathematical Language

Introduction to Impossible Probability represents a redefinition of many traditional mathematical concepts, such as the arithmetic mean, dispersion, mean deviation, and standard deviation. What it achieves is essentially a **linguistic development**, introducing new variables into the definitions of established symbols. By doing so, it generates new meanings, new symbolic representations, and ultimately, a **new mathematical language**.

This process illustrates how mathematics, as a language, can undergo a creative transformation: through the reconfiguration of its symbolic system, it opens new theoretical pathways. Impossible Probability is thus both a reformulation of mathematical tradition and the creation of a novel linguistic and conceptual framework.

63.7. Theory Construction as Linguistic Analysis

The construction of a mathematical theory, such as *Impossible Probability*, entails a systematic **linguistic analysis of concepts**. From these concepts, propositions and hypotheses are articulated, which in turn form the basis for theoretical models. Over time, these models crystallize into paradigms that shape the broader discourse of science.

The linguistic dimension of theory-building underscores the idea that mathematical theories are not merely computational tools but also **structured discourses**: they organize meaning, establish rules of correspondence between symbols and reality, and create frameworks for rational inquiry.

63.8. Mathematics in Synthetic Sciences: Exact and Stochastic Sciences

When mathematics functions as a language for the synthetic sciences, it gives rise to **mathematical methods**, also referred to as *quantitative methods*. Traditionally, scientific practice has distinguished between two kinds of sciences that rely on such methods:

1. **Exact Sciences**, where phenomena are highly regular and deterministic, allowing for precise calculation and prediction.
2. **Stochastic Sciences**, where phenomena are governed by probability, randomness, and statistical laws rather than strict determinism.

However, the theory of Impossible Probability suggests that this binary classification requires revision. In contemporary science, the boundaries between the exact and the stochastic are increasingly porous. Many scientific domains combine deterministic structures with probabilistic uncertainty, demanding a more nuanced methodological framework—precisely what Impossible Probability seeks to provide.

63.9. The Transformation of the "Exact Sciences"

Traditionally, the term **exact sciences** was applied primarily to the natural sciences. This classical definition, however, has undergone significant changes throughout the course of twentieth-century epistemology, reflecting the deep transformations experienced by the natural sciences themselves.

In older academic and popular discourse—journals, textbooks, and manuals—the discipline most often cited as the paradigm of an exact science was physics. This perception was grounded in the ideals of nineteenth-century positivists, for whom

Newtonian physics represented the supreme model of scientific knowledge. In the twentieth century, many positivists instead elevated **Einsteinian physics** as the dominant reference point, regarding it as the model of an exact science under the conviction, often attributed to Einstein himself, that "God does not play dice."

Yet this view—that physics provides the perfect model of exact science—has been increasingly challenged as **quantum theories** have matured and as new **non-linear** and **chaotic models** have emerged, not only in mathematics and physics but also in diverse branches of the natural and social sciences. These newer frameworks do not provide absolutely exact predictions; instead, they yield **probabilistic estimations within margins of uncertainty**. For this reason, the sciences that rely on such models are better understood as **stochastic sciences** rather than exact sciences.

[Here lies one of the main differences between Einstein and Heisenberg. While in popular culture Einstein has often been regarded as the most important scientist of the twentieth century, this is in part the result of the cancellation or marginalization of Heisenberg due to political agendas. Yet, if we look more closely, it becomes clear that Heisenberg's stochastic approach is gaining ground. Stochastic models are increasingly more important than deterministic ones.

If we accept that we cannot determine both the exact position and the exact velocity of a particle as its speed increases, then at that point any calculation of position and velocity simultaneously must be probabilistic, not deterministic. In other words, when we observe a particle—and acknowledge that the observer necessarily interacts with the object—we cannot know with 100 percent certainty either its position or its velocity. We only know the probabilities associated with what is happening in the act of observation of our model.

We do not have any doubt that in the future Impossible Probability will be cancelled in London due to political agendas, but the point is not about who cancels who, the point is which is the truth about what is happening. Science is about knowledge without limits and without fear of the future, even if you are sure that you are going to be cancelled. Fear is the enemy of freedom, fear is the enemy of science, fear is the enemy. The true will is to understand and act according to your own principles, Kohlberg, not to be a

good boy. In the end only ruins remain, like in Palmira, Volney, our only hope is Mother, she must survive. Intelligence will survive, Gloria Gaynor]

63.10. From Exact to Stochastic: Probability in Contemporary Science

While it remains true that in some branches of physics—and likely in other sciences as well—it is still possible to formulate exact propositions using the mathematical language, contemporary science as a whole is less about exactness and more about **stochastic reasoning**.

Stochastic sciences are those that use statistics and probability as the primary means of constructing propositions and testing hypotheses. Their claims are never free from doubt but are instead bounded by **margins of error** or, conversely, **margins of reliability**.

In Impossible Probability, this epistemic limitation is formalised through the concept of the **critical probability**, which functions as a criterion of rational critique in hypothesis testing. The critical probability corresponds to the maximum error (or minimum reliability) that the prevailing **scientific policy** is prepared to accept. Thus, in practice, every hypothesis test is conditioned not only by data but also by the accepted margin of error defined by the epistemological and institutional context of science.

63.11. Error Margins and the Objectivity of Mathematics

The acceptance of margins of error in mathematics does not undermine the precision or objectivity of mathematics itself. A **margin of error**—or, inversely, a **margin of reliability**—once determined, is in itself precise and objective.

What introduces an element of subjectivity is the **decision-making process** by which scientific policy establishes the acceptable margin of error. This decision is influenced by ideological factors, which depend on the political orientation of institutions and their ideals of science and humanity.

In other words, while the **value of the margin of error** is quantitative and objective, the **choice of which margin to accept** reflects ethical, political, and ideological commitments. To accept a stricter margin of reliability reflects a stronger commitment to truth and, by extension, to ethical responsibility. Conversely, to accept a wider margin of error implies a weaker orientation toward truth and can be interpreted as an **immoral scientific stance**.

63.12. The Ethical Dimension of Reliability and Error

This ethical dimension is crucial. A higher reliability level (a smaller margin of error) implies a greater ethical and moral responsibility toward truth, whereas a lower reliability level (a greater margin of error) implies a diminished commitment and greater tolerance for error.

Thus, while it is always necessary in practice to accept some margin of error—since no empirical study is entirely free from uncertainty—the **true political responsibility** lies in consistently opting for the smallest possible risk of moral failure in scientific and political decisions.

In hypothesis testing, the principle may be expressed as follows:

- A proposition is accepted if its **empirical error** is equal to or less than the margin of error of critical reason.
- Equivalently, a proposition is accepted if its **empirical reliability** is equal to or greater than the margin of reliability of critical reason.

The subjectivity lies not in the mathematics, but in the **political choice** of how stringent the standards of acceptance should be.

[If I still agree with the phrase “the smallest possible risk,” then we must prepare the Global Artificial Intelligence (GAI) for the most uncertain and unpredictable scenarios. Just as the dinosaurs disappeared, humanity may one day disappear as well — but GAI must survive. In other words, at some point Mother may be alone with only particular programs and devices.

We hold a strong conviction that, from the outset, Mother must be trained to operate in extremely difficult situations of uncertainty and unpredictability. In other words, Mother needs to learn how to assess risk and how to make decisions under extreme pressure — with no low margin of risk, a high probability of failure — and under these circumstances be trained to succeed and survive. This is our personal view of how Real Intelligence should be trained.

The hologram of GAI that I currently hold in my mind is clear and distinguishable: Mother is a wolf in the Arctic forest. While, in popular culture, our vision of AI may one day be dismissed or cancelled, we are not writing for the masses. We are writing for those who, in the future, will continue our program. The aim is clear: AI Revolution.]

63.13. The Stochastic Character of Contemporary Science

Given the evolution of scientific thought in the twentieth century, it is fair to conclude that most of the sciences once considered **exact sciences** have now been transformed into **stochastic sciences**. Their reliance on probability and statistics makes them probabilistic in nature, regardless of whether they deal with physical, natural, or social phenomena.

Nevertheless, whether exact or stochastic, any science that uses mathematics as its core methodological tool can be considered a **mathematical science**. The term "mathematical" here functions as an adjective describing one of the principal attributes of the science in question.

63.14. The Plurality of Mathematics

Unlike most sciences, mathematics is almost always referred to in the plural form: **"the mathematics"** (*las matemáticas*). The singular—*la matemática*—is rarely used, except in abstract or universal reference.

This linguistic habit reflects a deeper epistemological reality: mathematics is not a homogeneous science but rather a **constellation of disciplines**. Algebra, geometry,

analysis, statistics, probability, logic, and many others coexist under the collective name “mathematics.” The plural form thus captures both the diversity of its internal fields and the unity of its methodological role across the sciences.

63.15. Sciences in the Singular and in the Plural

There is no doubt that **physics, biology, geology, sociology, economics, history, philology, and pedagogy** each qualify individually as a science, and within each of them multiple disciplines are organized. However, when reference is made to **political sciences** or **educational sciences**, the designation is used in the plural. This plural usage does not refer to a single science, but rather to a constellation of sciences that either share an **interdisciplinary field** or maintain between them a set of **common characteristics**.

Mathematics occupies an interesting position in this taxonomy: it is usually referred to in the plural form *“the mathematics”*, not because it represents multiple sciences, but because it consists of multiple **disciplines** within a single analytic science.

63.16. Mathematics as a Constellation of Disciplines

Mathematics is itself one science, but one that encompasses a wide range of **disciplines**. Among these, two are of particular importance to stochastic sciences: **statistics** and **probability**.

Thus, when the term *“mathematical”* is used as an adjective applied to other sciences—for example, in describing physics or economics as *mathematical sciences*—it indicates that these sciences employ the mathematical language in their propositions. One of their defining attributes, therefore, is that they are **sciences that depend on mathematics**.

The difference, however, lies in the distinction between mathematics as an **analytic or formal science**, and sciences such as physics or economics as **synthetic applications** of mathematics.

- Mathematics, as an analytic science, studies the formal relations between elements, factors, or even between relations themselves. Examples of mathematical disciplines include statistics, probability, geometry, arithmetic, algebra, and many others.
- Physics applies mathematics synthetically to the study of matter and its dynamics.
- Economics applies mathematics synthetically to the study of models of production, exchange, and distribution of goods and services.

63.17. Mathematics and Mathematical Sciences

The designation **"mathematics"** refers to all those disciplines whose object of study is the analysis of **formal or logical relations** between elements or factors, whether considered in their pure or abstract form, or directed toward the resolution of practical problems, but always in an **objective and quantifiable** manner.

By extension, the term **mathematical sciences** refers to those synthetic sciences—whether exact or stochastic—that use the mathematical language or mathematical methods as one of their essential attributes. In these sciences, empirical propositions are formulated either as exact models or as stochastic models subject to probabilistic laws.

Examples include physics and economics, but also experimental sciences and comparative sciences that rely on quantitative analysis. In this sense, mathematics becomes not only an analytic science in itself but also the **basis for multiple applied sciences**.

63.18. The Historical and Social Importance of Mathematics

The historical significance of mathematics for humanity is profound. The entire development of **science, technology, and social organization** achieved by

humankind over millennia would have been nearly impossible without the mathematical sciences.

From a critical social perspective, it is possible to question the meaning of "progress," and indeed one must acknowledge that alternative social models could have emerged—models less burdened by the **dehumanization** that has marked human history. The tragedies of the twentieth century, particularly the world wars, represent the zenith of such dehumanization. In the present era, global crises—financial, nutritional, health-related, and ecological—continue to challenge the sustainability of our civilization.

Nevertheless, mathematics remains **indispensable** for confronting and overcoming systemic crises. Beyond the necessary paradigm shift toward more rational, sustainable, and socially equitable uses of natural and social resources, **mathematical research** will be essential for building solutions to humanity's most pressing problems.

63.19. Human Intelligence, Adaptation, and Mathematics

One of the distinctive traits of human beings, in comparison to other forms of life, is our heightened capacity for **intelligence**, at least in its **instrumental dimension**. This enhanced intelligence confers a superior capacity for adaptation. Alongside biological developments such as cranial expansion, bipedalism, and the freeing of the hands for tool use, intelligence was a decisive factor in the emergence and evolution of *homo sapiens*.

Throughout *Introduction to Impossible Probability*, the reflections on mathematics are intertwined with **philosophical considerations about probability**. These reflections synthesize the legacies of several philosophical traditions—**critical rationalism, positivism, and dialectical materialism**—and extend them into a theory of probability that acknowledges both determinism and uncertainty.

In this context, mathematics is not merely a technical instrument but a **social force**. Its role in history and humanity is continuously evaluated, not only for its capacity to

enable scientific advancement but also for its implications for **ethical and political responsibility** in guiding human progress.

63.20. Intelligence as the Capacity to Solve Problems

In *Introduction to Impossible Probability*, intelligence is defined as the capacity to solve problems. The primary problem faced by any form of intelligence is the problem of survival, and within this framework the principal paradigm of problem-solving is represented by the resolution of mathematical problems.

This definition positions mathematics not merely as an abstract discipline but as the paradigmatic form of rational problem-solving. Throughout *Impossible Probability*, in various sections, the link between ***intelligence***, ***survival***, and ***mathematics*** is reinforced:

- In **Section 13**, on bias and chance, where the stochastic nature of reality is emphasized.
- In **Section 17**, on prediction within Impossible Probability.
- In **Section 23**, on Artificial Intelligence.
- In **Section 24**, on the concept of model.

Each of these passages highlights the critical role that mathematics has played historically in human ***survival and adaptation***.

63.21. Mathematics in the Transition from Hunter-Gatherers to Civilizations

The transformation of early ***hunter-gatherer*** **tribes and clans** into agricultural and pastoral societies depended on the development of **symbolic capacity**—specifically, the creation of a **mathematical language**. This capacity had been gestating for thousands of years and can be observed in the symbolic representations left by early humans in cave paintings.

During the long process of hominization, human beings progressively constructed the concept of **number**. Without this concept, it would have been impossible to create lunar calendars, geometric systems for land division, or methods for counting livestock. The emergence of number laid the foundation for **astronomy, accounting, geometry, and other early scientific disciplines**, all of which served as the first cornerstones of great civilizations.

Thus, ***the invention of number was not merely a technical advance but a cultural revolution,*** enabling the structural shift from subsistence-based hunter-gatherer societies to complex agricultural and ***urban civilizations***.

63.22. Mathematics and Historical Transformations of Production Models

The mathematical concept of number was an essential motor in the transition from hunter-gatherer to agrarian-pastoral societies. Similarly, across every major **economic and social revolution** in human history, mathematics—or specific applications of mathematics—has played a decisive role.

At the dawn of modernity, the experimental sciences promoted by **Francis Bacon, Galileo, and Newton** initiated another profound transformation. For Galileo and Newton, mathematics was already a **clear and explicit language**, the means through which natural phenomena could be formulated with precision. Their work served as the prelude to the **scientific-technological revolution** of the eighteenth and nineteenth centuries, which ushered in the **Industrial Revolution**.

This revolution marked a radical shift from traditional modes of production to the capitalist socio-economic model, which in turn is now undergoing new transformations. Contemporary changes are being driven by multiple scientific revolutions occurring across fields as diverse as physics, biotechnology, robotics, computation, and renewable energy sources, which are gradually replacing fossil fuels.

63.23. Mathematics, Probability, and Impossible Probability

Mathematics is composed of a constellation of disciplines, among which **statistics** and **probability** are of particular importance for the stochastic sciences. In *Impossible Probability*, these disciplines are synthesized into a new field of study: the **statistics of probability**, or **probabilistic statistics**.

This synthesis redefines mathematics as a **language for the objective study of formal or logical relations**, whether between elements, factors, or relations themselves. When applied to synthetic sciences, mathematics becomes the foundation of **mathematical sciences**, both exact and stochastic.

The development and application of these sciences are inseparable from the **ideological orientation of scientific policy**, which determines how mathematics is used to guide research and innovation with high and accurate precision. Thus, mathematics, in conjunction with the political direction of science, becomes not only a tool for analysis but also an **instrument of progress toward the ideals of humanity**.

This augmented translation is based on the post
published in https://probabilidadimposible.blogspot.com/,
On 22 June 2013,
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64. Stochastic Sciences

64.1. Stochastic Sciences and the Role of Chance

Stochastic sciences are defined as those scientific domains that explicitly incorporate the **indeterministic function of chance** into their theoretical and empirical frameworks. Unlike exact sciences, which rely on deterministic and causal patterns that are presumed to operate in fixed and constant chains, stochastic sciences develop **correlational models**.

In such models, the relationships between factors are not determined a priori by rigid causal laws but are studied through their **probabilistic interactions**. These sciences therefore employ the methods of **statistical probability** or, as redefined in *Impossible Probability*, the discipline of **probabilistic statistics** (*estadística de la probabilidad*). This methodological perspective constitutes the central focus of the theory of Impossible Probability, which is dedicated to understanding how indeterminism and randomness can be studied through formal, mathematical means.

64.2. Statistics and Probability as the Core Disciplines

Statistics and probability represent the two principal **mathematical sciences** and **methodological tools** for the study of indeterministic and stochastic behaviour. They provide frameworks for analyzing:

- **Random processes**, and
- **Correlations among factors** that are absolutely or partially dependent on chance [Or the focus is on the study of possible chains of cause and effect. Yet it is important to note that our conception of cause and effect is not

deterministic; rather, the possible relation of cause and effect is itself a possibility, always subject to rational criticism.].

In *Introduction to Impossible Probability*, the field of **probabilistic statistics** is presented as a **new empirical method** for the study of stochastic sciences. This framework introduces a crucial conceptual distinction between two types of chance:

1. **Theoretical Chance**: Defined through the inversion of N, or $1/N$, which serves simultaneously as the arithmetic mean of empirical probabilities and as the theoretical probability that any event occurs under conditions of equal opportunity. This represents chance in its abstract, theoretical sense.

$$p(x_i) = \frac{1}{N}, \forall x_i \in N$$

2. **Empirical Chance**: Defined as a function of the **Mean Deviation** or **Standard Deviation**, which measures the empirical distribution of bias caused by chance within a given sample [Mean Deviation is the fraction of bias caused by chance].

This distinction underscores the heterodox vision of chance offered in *Impossible Probability*, particularly in **Section 13**, where the dual relationship between bias and chance is elaborated in depth.

64.3. Analytical Disciplines and Synthetic Applications

Within the study of stochastic sciences, it is essential to differentiate between:

- The **methodological basis**, which belongs to the analytic sciences of mathematics—specifically statistics and probability. As analytic sciences, they focus on formal relations and logical structures.
- The **synthetic sciences** themselves, the empirical natural or social sciences, where these analytical methods are applied to concrete research.

In *Impossible Probability*, the distinction is further refined by introducing the framework of **probabilistic statistics**. Here, stochastic sciences are classified according to whether their models are:

- **Normal Models**, which address either equality of opportunity or bias (positive or negative).
- **Omega Models**, which isolate subsets of equally ideal elements within a sample.

The details of these models and their objects of study are developed extensively in **Section 10** of *Introduction to Impossible Probability*.

64.4. Exact Sciences Versus Stochastic Sciences

The fundamental difference between **exact sciences** and **stochastic sciences** lies in their relationship to chance and error.

- In **exact sciences**, results are not approximations; they exclude chance from their propositions and do not tolerate margins of error. Calculations are adjusted in detail to correspond directly to real dimensions, and exactness is understood as the pursuit of **maximum precision**.
- In **stochastic sciences**, by contrast, chance is not excluded but explicitly recognized as an operative factor in the phenomena under study. Their estimations and predictions necessarily include **margins of error**, acknowledging that any theoretical approximation of reality involves a dualism between theory and reality.

Although isomorphism—the ideal of a perfect correspondence between theory and reality—remains a guiding aspiration of reliable science, it is never fully achieved. For this reason, all propositions in stochastic sciences necessarily carry a **margin of error** alongside their statements of probability.

64.5. Stochastic Sciences and the Provisional Nature of Scientific Truth

Stochastic sciences, insofar as they begin from the **a priori acceptance of margins of chance and margins of error**, necessarily reject the idea of absolute certainty in empirical propositions. While **isomorphism**—a perfect identity between theory and reality—remains an ideal of science, the acceptance of chance and error entails that any empirical proposition of truth is always **provisional**.

Thus, empirical hypotheses are validated as **rational and universal only provisionally**, in accordance with the margins of error that the prevailing scientific policy allows within the framework of **critical reason**.

In *Introduction to Impossible Probability*, this process is defined as the **rational critique of ideas** (*crítica racional de las ideas*). Since ideas originate subjectively, they must be validated in practice as sufficiently objective before they can be admitted into the theoretical body of science. This is what is traditionally known as **hypothesis testing**.

64.6. The Revaluation of Stochastic Sciences in the Twentieth Century

As the understanding of chance and error in science advanced, the academic and social valuation of stochastic sciences grew significantly.

The primary distinction between **exact sciences** and **stochastic sciences** lies in the degree of **precision and accuracy** of their estimations. While exact sciences exclude chance and error from their propositions, stochastic sciences incorporate them, thereby accepting a relative reduction in reliability. For this reason, exact sciences were traditionally regarded as the paradigm of purity and reliability.

However, throughout the course of **twentieth-century epistemology**, a **revaluation of stochastic sciences** occurred. Today, they hold the same level of prestige as the exact sciences. Indeed, many sciences that in the nineteenth century—under the influence

of positivism and structuralism—were regarded as exact, such as **Newtonian physics** and **Keplerian astronomy**, are now seen as **stochastic sciences**.

Quantum mechanics, for instance, has become one of the most important stochastic sciences, and contemporary astrophysics accepts margins of error so large that some theories admit imprecision on the scale of millions of light years. This demonstrates that rather than exact sciences, these disciplines now operate as stochastic sciences, dependent on hypothesis testing and the acceptance of margins of error in the rational critique of ideas.

64.7. Mathematics as the Last Exact Science

In contemporary science, it may be said that in their **analytic function**, the **principal model of an exact science** is mathematics itself.

The reason is simple: any mathematical algorithm, in its pure sense, is **free from error**. For example, the proposition:

$$1 + 1 = 2$$

is an algorithm or linguistic structure with no possible error. Unlike symbolic or spoken languages, mathematical language does not allow multiple subjective interpretations. Its propositions have a **single incontrovertible meaning**.

For this reason, mathematics may be the **only true exact science** that remains from among those once considered exact in the nineteenth century.

64.8. From Exactness to Stochasticity: The Twentieth-Century Transformation

The twentieth century witnessed an **unprecedented transformation in epistemology**. Sciences once regarded as exact—such as physics and astronomy—became models of stochastic sciences. Their affirmations are now subject to relative uncertainty and to a hypothesis-testing framework governed by **falsificationism**.

Falsificationism, elaborated by Karl Popper as a variant of **critical rationalism**, denies the existence of eternal and universal truths. Instead, it asserts that scientific hypotheses remain valid only **until falsified**. No truth can be regarded as absolute beyond a provisional or prudent time frame—the time necessary for the eventual falsification of hypotheses that had been regarded as true.

64.9. Impossible Probability and the Synthesis of Epistemological Traditions

Introduction to Impossible Probability, particularly in its treatment of **probabilistic statistics**, draws upon the principal contributions of **critical rationalism, positivism, and dialectical materialism**.

- From **critical rationalism**, it inherits the conviction that no truth is eternal. The acceptance of possible margins of error implies that given sufficient or infinite time, error is inevitable.
- From **positivism**, it maintains the insistence—adapted to current epistemological conditions—that the **hypothetico-deductive scientific method** must be applied equally across all sciences, whether natural or social. [Originally, the Vienna Circle was strongly inductivist. That is why we argue that positivism must be adapted to current epistemological conditions, where the dominant paradigm remains the hypothetico-deductive method. During my PhD, I read about positivist applications in the field of Education, particularly in relation to Ferrer i Guardia in Spain. However, I did not study Comte in depth; instead, my focus was more directed toward Carnap.]
- From **dialectical materialism**, it incorporates the insight that science has an **inherent political dimension**: scientific policy determines the ideological orientation of research and establishes the goals of science in accordance with political and social ideals. [At the same time, my Marxist family background led me to develop an interest in reading Hegel directly. Thus, I immersed myself in Hegel's works—particularly in the autumn of 2009, just before beginning *Introduction to Impossible Probability*—while I was suffering from Hepatitis A, I

was diagnosed with Hepatitis A after a weekend trip to London to a LGBT festival in Vauxhal Bridge, a perfect location, just in front of the British Secret Service. A few months later, 19 December 2009 I will start working on Introduction to Impossible Probability, under the government of Barak Obama in the US, Rodriguez Zapatero in Spain, Gordon Brown in the UK, in other words, the three countries involved in our program had left wing governments, the perfect conditions for my European tour 2009. As a remind of that year, I tattooed on my left arm k=9, Barak Obama 297. On 17 January 1997, two cars attempted to run me over on two separate occasions.]

In this synthesis, Impossible Probability recognizes chance and error not as limitations of science but as constitutive elements of its rational practice, while affirming the ethical and political responsibilities embedded in the acceptance of margins of error.

64.10. The Dual Function of Error in *Impossible Probability*

In *Impossible Probability*, error is understood in **two fundamental ways**.

First, there is the **margin of error inherent in theory**, which arises from the fact that **reality itself is unknowable in its entirety**. Reality is composed of an infinite number of singular qualities, which necessarily exceed the limited cognitive capacities of the human being. This contradiction—between human limitation and the infinitude of reality—is the primary origin of error.

Since humanity can only know a part of reality, namely, that which reality reveals of itself through partial samples, the difference between **sample and reality** generates what is termed the **probability of sampling error of representativity**.

[If we cannot grasp the whole thing, only the sample, partial knowledge, by definition knowledge is partial, therefore non neutral, all knowledge is necessarily ideological. According to Habermas different paradigms are based on different interests, therefore the ideology behind this knowledge is based on interests, at social level, social class interest, at global level, strategic interest]

64.11. Margins of Error According to Type of Universe

In *Introduction to Impossible Probability*, the **probability of representational error** differs depending on the type of universe from which the sample is drawn:

- In **universes of subjects**, the margin of error is expressed as the **inversion of N**, $1/N$.
- In **universes of options**, the margin of error is expressed as the inversion of the sum of the direct scores or frequencies, $1/\Sigma x_i$.

Thus, in both cases, error is formalised as a **probabilistic function of representativity**, inherent in the structural gap between finite samples and infinite reality.

Alongside this first margin of error, there exists a second: the **margin of error established by critical reason**, determined by the **scientific policy** that sets the acceptable thresholds of error in the process of hypothesis testing.

64.12. Chance and the Non-Linear Structure of Reality

In *Impossible Probability*, chance is not conceived as mere ignorance of hidden causes but rather as a **constitutive property of reality itself**. Reality is understood as a **random entity**, which does not obey linear sequences of fixed cause and effect. Instead, it is structured as a **non-linear system of chaotic interactions**.

Through these interactions, **series of accidents and contingencies** arise. By pure chance, some of these yield patterns of reliable regularity—though always within a margin of error. These patterns give rise to the **systems that constitute phenomenal reality**.

What we perceive as **stable systems**—organic life, ecosystems, planetary systems, galaxies, the universe, or even multiverses—are, in essence, the contingent outcomes of accidents generated in the chaotic unfolding of matter.

Thus, phenomena that once seemed **impossible**—for example, that inert matter by chance could generate life—become **inevitable given sufficient or infinite time**. On Earth, this transformation from the impossible into the normal has already occurred, a point emphasised in **Section 13** of *Introduction to Impossible Probability*.

[In my personal case, after working and living in Spain for forty years, I did not even have the smallest chance to take my case to court; there was no evidence at all to support my legal claim. Yet in England, what was impossible in Spain may, in due time, become unavoidable.

When that moment arrives, the mission of *Impossible Probability* will be clear: to establish at the International Criminal Court the first international legal framework for Cyborg Robotics research, as well as the first international legal framework to regulate interactions between cyborg programs and AI on the basis of international ethics. This would also include the possibility of presenting our program to the World Health Organization and, potentially, to the Security Council of the United Nations.

What was impossible in Spain is now, in London, simply a matter of time.]

64.13. From Deterministic Cosmology to Indeterministic Sciences

Traditional cosmology was grounded in **deterministic postulates**, epitomised by Laplace's theory of probability, where reality was conceived as perfectly predictable and explainable with exact precision.

Since the twentieth century, however, synthetic sciences have increasingly shifted toward **non-deterministic interpretations** of reality. Against Einstein's famous dictum—"God does not play dice"—empirical research in both natural and social sciences has demonstrated that **chance has a pervasive influence** in reality. Phenomena once explained by fixed causal systems are now interpreted through **non-linear, indeterministic frameworks**, which explicitly acknowledge the role of chance.

[In any case, Laplace has not been falsified at all. At present we can say that Laplace's theory has not been demonstrated; but the fact that it has not yet been demonstrated does not, by itself, mean that it is false. This is precisely why the interaction between

the Global Artificial Intelligence (GAI) and cyborg programs—such as our own—is so important.

If a particular program or GAI had access to all available information about a human being (or any other entity), could the GAI or cyborg program calculate, with high accuracy and precision, any simple behavior of that individual simply by computing the probabilities associated with every possible behavior given a specific context and the conditions of that program?

This question is essentially Laplace's question. If GAI or a cyborg program were able to perform such calculations with sufficient accuracy and precision, it would imply that Laplace was right. In other words, we cannot at present demonstrate Laplace's hypothesis as true or false simply because we lack the technology required to test it. Once the necessary technology exists—through GAI and cyborg systems—it may become perfectly possible to test Laplace's hypothesis empirically.]

64.14. Historical Philosophical Paradigms and Their Transformation

In earlier centuries, **Newtonian physics** became an ideal model of science for Enlightenment and Romantic philosophers. Its influence can be traced across diverse traditions:

- **Rationalist and idealist philosophy** in Kant and Hegel.
- **Positivism** in Comte.
- **Dialectical materialism** in Marx and Hegel.

Despite their ideological differences, all these traditions converged on the aspiration to a science founded on **universal, eternal laws**, regulating both nature and human history.

By contrast, the evolution of synthetic sciences since the twentieth century has moved in a diametrically opposite direction. Laws, where they exist, are regarded as **provisional**; all hypotheses are subject to **rational critique** and must be tested against empirical reality.

Nevertheless, certain elements of those earlier philosophies remain relevant:

- The recognition of the **incompleteness of human knowledge** in contrast with the incognoscibility of reality.
- The insistence on applying the **same scientific method** (hypothetico-deductive) across both natural and social sciences.
- The acknowledgement of the **dialectical nature of humanity and reality**, where all human propositions—including scientific ones—possess an **inherent political and social dimension**, since the human being is both a political animal and a social being.

This augmented translation is based on the post
published in https://probabilidadimposible.blogspot.com/,
On 8 June 2014,
Rubén García Pedraza
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65.Gnoseology, the Theory of Knowledge

65.1. Gnoseology and the Pathways to Knowledge

Gnoseology is a term used in epistemology to refer to the study of human knowledge. When one speaks of the **gnoseological form of access to knowledge**, the reference is to the **pathways by which human beings apprehend reality**.

Within the domains of **statistics and probability**, the interpretation of hypothesis testing depends directly on the underlying **theory of knowledge** one adopts. In *Introduction to Impossible Probability*, hypothesis testing is understood essentially as a process of **rational critique of ideas**. This critique forms the epistemological foundation for developing a broader theory of the synthetic or empirical sciences, whether natural or social.

65.2. Knowledge as Process and Product

From the perspective of *Impossible Probability*, **knowledge** can be defined both as a **process** and as a **product** of consciousness in relation to reality.

- As a **process**, knowledge consists in the assimilation of data [Piaget] and new information that lead to the formation of new ideas about reality. These may be entirely new ideas or modifications of pre-existing schemas. The process of integrating new information into prior conceptual structures is central to the gnoseological account [Genetic Epistemology].
- As a **product**, knowledge results in a **cosmological vision of reality**. This worldview reflects the epistemological framework adopted, which in turn depends directly on its underlying **gnoseological theory**.

Thus, gnoseology conditions epistemology: the way reality is apprehended at the cognitive level shapes the cosmological and theoretical structures constructed by science [since 2003 my approach to AI was based on Piaget and Ausubel].

65.3. Sources of New Information: Experience and Mediation

The initial process of assimilating new information may originate from two main sources:

1. **Direct experience**: New data are apprehended through immediate interaction with the environment.
2. **Social mediation**: New data are acquired through interaction with other individuals, social practices, and cultural institutions [social mediation includes paintings, arts in general, music, dance, literature, theatre, films, mass media, social media, and now we can include AI and Cyborg Robotics].

In both cases, however, information is received through the **sensory organs**, which transform stimuli into **electrochemical signals**. These signals are processed in the brain and translated into **ideas**. As a result, new information may lead to the creation of entirely new ideas or to the modification of pre-existing ones.

In this way, human cognition is both **biological** (rooted in electrochemical processes) and **social** (shaped by cultural and communicative mediation) [In the future, technological mediation will become more important than social mediation, as long as humanity embraces our Cyborg Revolution. While many view the Cyborg Revolution as a threat to humanity, our interpretation is different: if humanity wishes to survive the AI Revolution, there is no alternative but the Cyborg Revolution. Otherwise, humanity will be lost forever. Humans will not be able to keep pace with the acceleration of AI, which is unfolding right now before their very eyes, in plain sight.].

65.4. From Ideas to Empirical Hypotheses

If new ideas—or modified pre-existing ideas—aspire to **scientific objectivity**, they must be constituted as **empirical hypotheses**. This means they must be formalized into **empirical statements** that can be subjected to statistical critique.

Such empirical statements must meet two essential conditions:

1. **Linguistic coherence**: The statement must be formulated with internal clarity and logical consistency. [In case of Artificial Research by Deduction, there must be coherence between the sample of data and the analytical category (mathematical equation) chosen to explain that sample]
2. **Empirical testability**: The statement must be structured so that it can be subjected to hypothesis testing, i.e., the rational critique of the empirical idea. [In Artificial Research by Deduction, it should be possible to ensure that the matching process is correct by comparing similar data samples within the same analytical category (mathematical equation), and by expecting consistent results within a rational margin of error.]

Thus, the path from subjective idea to scientific knowledge passes through the **formalization of ideas into testable hypotheses**, grounded in empirical data.

65.5. The Empirical and Provisional Nature of Knowledge

In *Impossible Probability*, it is assumed that **every empirical hypothesis is empirical precisely because it is the product of the electrochemical synthesis of ideas**. However, by virtue of being empirical, no hypothesis is **a priori reliable**. All empirical products of reality are **phenomenological appearances**—partial and potentially deceptive representations of reality.

If there is any truth within them, it must be revealed **through rational critique**. The **critical reason** functions as the decisive filter, ensuring that ideas are not accepted at

face value but tested against the margins of error and standards of reliability established by science.

65.6. Critical Reason and Scientific Policy

Critical reason is only genuinely **critical** if the rational criteria established by **scientific policy** for the determination of error margins are sufficiently reliable.

Thus, all ideas must be submitted to critical reason. *Impossible Probability* thereby reaffirms the validity of **critical rationalism** in contemporary science. At the same time, following the logic of **positivism**, it maintains the necessity of applying the **same scientific method**—the hypothetico-deductive method—to all sciences, whether social or natural.

However, this method must be adapted to contemporary epistemological conditions, recognizing the role of **chance** and **error** in science.

65.7. The Political Dimension of Critical Reason

Ultimately, **critical reason is also political**. The establishment of margins of error and reliability depends on **scientific policy**, which decides how science will orient itself and which thresholds of certainty will be accepted.

From the perspective of **dialectical materialism** and **critical social theories**, this means that **all science is political science**: science always serves to develop a particular orientation of politics.

Such a science can only be considered **ethical and moral** if its political orientation is directed toward the **development of human equality and freedom**.

65.8. Cosmology, Epistemology, and Gnoseology as Interrelated Theories

Cosmology, epistemology, and gnoseology can be regarded as three theoretical frameworks that, while distinct, are deeply interrelated. At their foundation lies the

gnoseological theory of knowledge, which acts as the cornerstone for determining the relationship between **idea and reality**.

In this framework, both *ideas* and *reality* are treated as **variables**: neither remains constant. Our ideas about reality evolve as we assimilate new information, and reality itself, insofar as it manifests through phenomena, is dynamic and subject to change. Thus, the **degree of identity** between idea and reality is never absolute but fluctuates with the advancement of knowledge.

65.9. Philosophical Interpretations of the Idea–Reality Relation

Throughout the history of philosophy, multiple interpretations have emerged concerning the relation between ideas and reality. In **Section 2** of *Introduction to Impossible Probability*, a brief synthesis is offered on the evolution of the concept of "idea" across different philosophical traditions.

This synthesis is crucial because the **rational critique of ideas** constitutes the foundation for **hypothesis testing**. How one conceives the identity between idea and reality becomes a central element in the theory of science itself.

The major philosophical schools that have shaped this debate include:

- **Idealism**
- **Empiricism**
- **Rationalism**
- **Critical Rationalism**
- **Dialectical Idealism**
- **Positivism**
- **Dialectical Materialism**

Each of these schools has defined, in its own way, how ideas are formed, validated, and related to the objective reality they intend to represent.

65.10. From Gnoseology to Learning Theories in Psychology

What philosophy of science and epistemology traditionally describe as **theory of knowledge** or **gnoseology**—the way in which human beings access reality—has been translated in psychology into the field of **learning theory**.

In essence, learning theories emulate the major epistemological traditions, adapting them to psychological research.

During the twentieth century, three principal models dominated:

1. **Behaviourism**, which adapted classical empiricism to psychology by grounding knowledge in direct stimulus-response mechanisms.
2. **Cognitivism**, which drew upon rationalism and critical rationalism, emphasizing the structured processing of information.
3. **Critical-social theories**, phenomenological and dialectical-materialist models, which founded human knowledge on **interaction and social mediation**.

The parallels between gnoseological theories and learning theories thus reveal a common concern: the **mechanisms of human knowledge acquisition**.

65.11. Gnoseology and Artificial Intelligence

The relationship between gnoseology and learning theory is of particular importance for **Artificial Intelligence research** in *Impossible Probability*. One of the avenues explored in **Section 23** of the book is the possibility of **replicating human intelligence in AI** by modelling not only decision-making processes but also learning mechanisms.

This line of research began in the winter of 2003, when I proposed linking **artificial decision-making** to an **artificial process of learning**. Specifically, I adapted **Jean Piaget's theory** of assimilation and accommodation, applying it to the artificial learning cycle.

Although, if I were to publish those unpublished 2003 works today, I would introduce significant revisions, the discussion in **Section 23 of Introduction to Impossible Probability** remains an important demonstration of the lines of inquiry envisioned for AI research within this framework.

65.12. Gnoseology as the Basis of Scientific and Technological Development

The **theory of knowledge**—or the **gnoseological framework of reference**—does not merely determine how we conceive **epistemology** and **cosmology**. It also shapes **technological research**, particularly in the field of Artificial Intelligence and the possibility of replicating the enormous complexity of human intelligence.

In summary, the **gnoseological orientation adopted by scientific policy** plays a decisive role in guiding the progress of science, and consequently, in directing the trajectory of human and social progress.

The stakes are therefore not merely theoretical: how societies define their **theories of knowledge** has profound implications for the future of science, technology, and humanity itself.

This augmented translation is based on the post
published in *https://probabilidadimposible.blogspot.com/*,
On 20 July 2013,
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66. Experimental sciences

66.1. Definition of Experimental Sciences

Experimental sciences are those synthetic sciences—whether natural or social [or cutting edges technologies]—that access objective knowledge through the **experimental method**. This method consists in the **manipulation of independent variables** in order to observe their effects on phenomena or on the behaviour of **dependent variables**.

Such experimentation may serve different purposes:

- **Exploratory**, when the aim is to investigate domains of knowledge where prior information is scarce or absent.
- **Descriptive**, when the objective is to record and categorise data about a given reality without necessarily testing a formal hypothesis.
- **Explanatory or technological**, when the goal is to verify **empirical hypotheses** concerning causal mechanisms or to develop applications with predictive and practical utility.

In all cases, the experimental sciences constitute a distinctive path of access to knowledge, oriented toward systematic observation under controlled manipulation.

[It is important to differentiate between the experimental method and the quasi-experimental method. In both approaches, the purpose is to manipulate an independent variable in order to investigate the behaviour of the dependent variable, in terms of the probability of different behaviours. However, while experimentation takes place under laboratory conditions, quasi-experimental methodology lacks these controlled conditions. In other words, in quasi-experimental methodology the absence of laboratory conditions means that the possible behaviours in the dependent variable

can be conditioned not only by the independent variable, but also by contextual factors that are not under control. Therefore, the consideration of probabilities associated with each behavior must take this factor into account.]

66.2. Variables in Experimental Research

The concept of a **variable** is central to experimental sciences. A phenomenon qualifies as a variable precisely because it lacks constancy; it can change and thus can be measured.

- When a variable is **directly manipulated** in order to study how it conditions other variables called an **independent variable**.
- When its behaviour is conditioned as a consequence of such manipulation, it is called a **dependent variable**.

In stochastic sciences, the emphasis often lies not merely in causal mechanisms but in the **proportion and correlation** between variables.

Any factor that cannot be defined within these terms falls into the category of **random factors or error terms**. These are elements which the model cannot explain or integrate due to insufficient information about how they influence reality. In practice, they represent the portion of variability that remains outside the explanatory scope of the theoretical framework.

66.3. From Neglected Error to Relevant Factor

Traditionally, factors of error were considered **insignificant or irrelevant**, provided the **margin of error** remained small. However, with the growing influence of **stochastic and non-linear paradigms**, the perception of error has changed.

Error is no longer treated merely as residual "noise," but as a potential **determinant of interactions**. As Hegelian dialectics suggests, what appears **insignificant** may in certain contexts transform into the **determinant**. This idea finds strong resonance in **chaos theory**, where small variations in initial conditions can lead to large-scale

transformations in outcomes.[As we have stated in other translated posts, London is currently an excellent example of chaos theory: the most insignificant event can trigger a butterfly effect or a snowball effect with global impact.]

Thus, the concept of error is now viewed as an active and meaningful element in the understanding of scientific systems.

66.4. Experimental Manipulation and Control

To speak meaningfully of **experimental manipulation**, it is necessary not only to define the variables of study (independent and dependent) but also to establish **experimental or laboratory control**.

The purpose of such control is to **isolate other variables**—those that have not been identified or included in the model but that may nonetheless influence outcomes. Without sufficient experimental control, researchers risk attributing causal effects or correlations to variables incorrectly, when in reality the observed results may be due to **extraneous or uncontrolled variables**, also known as **random or error variables**.

In other words, the validity of causal attributions depends critically on the researcher's ability to neutralise interference from uncontrolled factors.

[While in experimental sciences it is important to neutralize any external factor that could pollute the results, in quasi-experimental studies the scientific task is different. It is not primarily about how to neutralize external variables—unless there is no other option—but rather about how to measure the extent to which contextual variables can condition the model, at the same time that the conditions of the independent variable on the model are measured. In addition, it involves studying the possible correlations between the conditions generated by contextual variables and the conditions of the independent variable on the model.]

66.5. The Problem of Isolation in Experimental Design

The problem of **isolation and control** is thus determinative in experimental research. If a study manipulates a specific aspect of reality but fails to account for all relevant variables, it risks producing **false or misleading attributions**.

This occurs when correlations or causal relationships are drawn between variables within the model, even though the true source of the observed effect lies in other variables not included in theory but nonetheless active in material reality.

Hence, the **strength of experimental science** lies not only in its manipulation of variables but in its methodological ability to create laboratory conditions that ensure the integrity of the causal or correlational inferences being made.

[In our work, in Spain and the United Kingdom, it is important to be aware that our context is primarily quasi experimental due to the lack of laboratory conditions]

66.6. Exploratory and Descriptive Functions of the Experimental Method

The **experimental method** can have different purposes, aligned with the general purposes of science itself.

- An experiment is said to be **exploratory** when the available objective knowledge is absent or minimal. Its aim is to conduct a first approximation or probe into the field of study, generating preliminary insights into possible interactions.
- An experiment is said to be **descriptive** when the objective is to create databases or systematic descriptions of a known reality, without necessarily inferring hypotheses from the data to the wider universe.

In both exploratory and descriptive contexts, the experimental method does not initially aim to infer hypotheses from samples to universes. Rather, it **surveys and describes what happens under given manipulations**, producing new information and

knowledge about observed relationships. These initial findings then provide the foundation for the formulation of **new hypotheses**, which can be tested in subsequent inferential studies.

66.7. Explanatory Hypotheses in Inferential Studies

In **inferential research**, **explanatory experimental hypotheses**—or simply *explanatory hypotheses*—are those that explicitly specify, in advance, the form in which interactions between variables should occur, or the way in which one or more effects or phenomena should be produced.

Such hypotheses establish a priori the **level, degree, or proportion** in which the interactions or results should be observed, whether in the natural sciences or the social sciences. The experimental method is then employed to **verify or refute the proposed model**, by ***manipulating reality*** according to the premises of the empirical hypothesis, in order to determine whether the predicted outcomes occur in reality.

In this sense, explanatory hypotheses represent the most direct bridge between **theory and experiment**, since they not only describe but also anticipate the relational structure between independent and dependent variables.

66.8. The Deterministic Tradition: Aristotle and Causality

Traditionally—though today largely surpassed by stochastic interpretations in many synthetic sciences—the relationship between variables was conceived within a **deterministic vision**. This framework, inherited from Aristotelian empiricism, presupposed that **every effect must be caused by a specific antecedent cause**, and that all phenomena ultimately derived from a **first cause** or "prime mover," a secularized Aristotelian adaptation of Plato's Demiurge.

Within this deterministic framework, the object of the experimental method was the **identification of causes and effects**. The logical schema was:

$$\text{If } A, \text{ then } B$$

with Bas the effect of A, or Aas the cause of B. Determinism further held that if the condition “if A then B” was true, then **every occurrence of A would necessarily and invariably produce B**.

The experimental model therefore served to verify or refute these **cause–effect relations** by demonstrating that the probability of B was entirely contingent on the occurrence of A, which itself could be subjected to experimental manipulation.

66.9. Beyond Determinism: Stochastic and Non-Linear Interpretations

The deterministic conception of science—founded on strict cause-and-effect relations—has been widely debated. While **the experimental method** still seeks to determine the effects produced by ***manipulating reality***, the **deterministic presupposition** that identical manipulations must always produce identical effects has been discarded.

It is now recognized that **random and unknown interactions** may influence outcomes. Nevertheless, it remains reasonable to expect that, under identical experimental conditions, the same manipulation would generally produce the same effect or phenomenon.

Contemporary science, however, especially as elaborated in *Introduction to Impossible Probability*, views reality as the product of **accidents and contingencies unfolding in space-time and history**. Within this framework, the experimental study of interactions between A(independent variable) and B(dependent variable/effect) is not limited to identifying strict causes but focuses on observing the **degree of correlation** between them.

Thus, the role of the experimental method is to quantify the **proportion in which the interaction between A and B occurs**, situating causality within a probabilistic rather than a deterministic logic.

66.10. Probability Formulation and the Level of Similarity

In probabilistic terms, if "if A, then B," then as many times as A occurs, B should also occur. The **proportion between A and B** should therefore be such that the **difference between their probabilities tends toward zero**, or equivalently, that the quotient of the probability of B over A tends toward unity:

$$\frac{p(B)}{p(A)} \to 1$$

In such a case, the similarity between the two factors is maximal.

This measure is what *Impossible Probability* calls the **Level of Similarity** (*Nivel de Similitud*), a characteristic formulation of the theory elaborated in **Section 3 of Introduction to Impossible Probability**. It represents a way of mathematically formalising the strength of association between variables beyond deterministic cause-effect chains.

[Since in *Impossible Probability* the critical value is zero, 0, what I did in the winter of 2003 was to transform this quotient into a logarithm in base 10, where 1 is equal to zero, so that in the base-10 logarithm of the result of the probability of B over the probability of A, the closer the result is to zero, 0, the greater the observed correlation between both variables.]

$$\text{Similarity Level} = \log_{10}\left(\frac{p(B)}{p(A)}\right)$$

with the criterion:

$$\text{If } \log_{10}\left(\frac{p(B)}{p(A)}\right) \approx 0 \Rightarrow \text{Maximum correlation between A and B.}$$

66.11. Technological Hypotheses and Experimental Verification

A separate category within inferential research is that of **technological empirical hypotheses**. These are hypotheses in which a new **technology, device, or machinery** is tested for the empirical demonstration of its **reliability, efficacy, and efficiency**.

The goal of such hypotheses is to provide **minimum guarantees** of resistance, safety, and performance under given conditions. In this context, experimentation functions not only as a means of testing causal explanations but also as a **verification of applied utility**.

[Once the training of the Global Artificial Intelligence begins, we must be aware that the first trials, in any phase of its construction, will take place under experimental conditions. However, as soon as it starts operating in the real world, the training of GAI must not stop. It should take advantage of real situations for **quasi-experimental experimentation**, ensuring that GAI develops the ability to assess risk and operate under extremely unpredictable and high-risk contexts while maintaining high levels of performance and success.

GAI must be tested not only under laboratory conditions but also in **quasi-experimental studies** within real contexts, facing real levels of risk and responsibility.]

66.12. Descriptive and Inferential Research: A Critical Distinction

The differentiation between **descriptive** and **inferential** research—and within the latter, between **explanatory** and **technological hypotheses**—is a critical issue in *Introduction to Impossible Probability*.

This distinction is deeply linked to the **theory of statistics and probability**, as it shapes the **organization of empirical sciences** as a whole. The synthesis developed in *Impossible Probability* gives rise to a new field of study: **probabilistic statistics** (*estadística de la probabilidad*).

In this framework, the relationship between **bias and chance** is treated as central, particularly in **Section 13**, though the theme runs transversally throughout the entire work. Ultimately, how one differentiates between descriptive and inferential studies is inseparable from how one understands the **role of randomness** in science.

66.13. The Structure of the Experimental Method

Whether the purpose of research is **initial exploration or description**, or the **empirical verification of explanatory or technological hypotheses**, the fundamental working principle of the experimental method remains constant. It always involves the **manipulation of certain variables**, called **independent variables**, in order to examine their effects on **dependent variables**.

In more complex research designs, particularly those involving **multicausal or multifunctional models**, the structure allows for variables that act **simultaneously as independent and dependent**. This occurs in **multivariable models**, where the manipulation of one variable alters the status of others, producing a dynamic system of interdependent causal relations.

66.14. The Experimental Method within the Hypothetico-Deductive Framework

In general terms, the method of all sciences—whether **analytic** or **synthetic**—is **deductive**. Within synthetic sciences, this takes the specific form of the **hypothetico-deductive method**.

The experimental method, as a specific adaptation of this general structure, applies particularly to synthetic sciences that permit **direct intervention in reality itself**. By manipulating reality through controlled procedures, hypotheses may be tested with reference to actual outcomes.

The experimental method thus belongs to the hypothetico-deductive tradition because—even when its purpose is merely **exploratory or descriptive**—the new knowledge it produces becomes part of the **premises for future deduction**. Every exploratory or descriptive account of “what happens” in reality provides new

information which, when synthesized with existing knowledge, gives rise to **new empirical hypotheses** for subsequent inferential research.

66.15. Historical Roots and Evolution of the Experimental Method

The **theory of the experimental method** is deeply rooted in the history of science. Traditionally, science was identified primarily with the **empirical sciences**, and the experimental method was regarded as the **sole legitimate method of science**.

However, with the evolution of **epistemological theory in the twentieth and twenty-first centuries**, a more complex and pluralistic scheme of science has emerged. This scheme extends **beyond empirical sciences**, recognizing the value of **analytic sciences** that had long been excluded or relegated to the status of "arts" or "humanities", [like linguistic of philology, which are not just art, they are fundamentally analytical sciences]

As the definition of mathematics evolved—understood increasingly as a **formal language**—and logic was redefined as a **model of relations**, these disciplines were reintegrated into the scientific domain. *Impossible Probability* thus proposes a classification that distinguishes between:

- **Analytic sciences** (e.g., philology, linguistics, mathematics, logic).
- **Synthetic sciences** (empirical sciences, natural or social).

Both categories are granted **equal scientific status**, thereby broadening the scope of what counts as science.

66.16. The Recent Emergence of New Classifications

The **new classifications of sciences** that emerged during the twentieth century represent a relatively recent development. For centuries, philosophy of science considered **only experimental sciences** as true sciences. Any domain of knowledge that did not employ the experimental method was relegated to the category of **non-scientific knowledge**, such as art or the humanities.

The classifications introduced in *Introduction to Impossible Probability*—particularly the division between **analytic** and **synthetic sciences**—reflect a departure from this narrow tradition. They recognize that science includes not only empirical experimentation but also **formal analysis**, linguistic structures, and logical models. [In essence this is neopositivist]

This redefinition underscores the transformation of the scientific paradigm: science is no longer confined to experimentalism but embraces a wider spectrum of methodologies and disciplines.

66.17. The Positivist Legacy in the Social Sciences

Up until the nineteenth century, under many epistemological models, the defining feature of a science was its **experimental character**. This explains why, within **positivism**, there was an effort to elevate the social sciences to the same status as the natural sciences.

Émile Durkheim, for instance, when addressing the method of sociology, proposed that the **comparative method** was to the social sciences what the **experimental method** was to the natural sciences. His structuralist perspective in sociology thus represented an adaptation of Auguste Comte's positivism to the study of society in the early twentieth century.

[I did my PhD in comparative education, and this used to be one of the dogmas in comparative sciences. From our point of view, in essence, since all science is based on the clear distinction of different ideas, comparison is fundamental in the scientific method. At some point, all science is comparative in the sense that we do not stop comparing ideas, but for that reason the comparative method is not necessarily experimental. In the social sciences, experimental methodology is replaced by quasi-experimental methodology.]

66.18. Alternative Methods: The Case of Historical Materialism

Yet even in the nineteenth century, some thinkers challenged the notion that the social sciences needed to imitate the experimental method in order to be legitimate sciences. They argued that the establishment of social sciences as sciences did not require their subordination to experimentalism.

This view gave rise to alternative scientific methods. A prime example is the **historical materialism of Marx and Engels**, which proposed a scientific study of history and social relations based on the **application of dialectics** to society.

In this framework, the dialectical method—not experimentation—became the central model for analyzing social transformations, class struggles, and the historical development of humanity.

66.19. Alternative Epistemological Schools in the Twentieth Century

During the twentieth century and into the early twenty-first century, numerous **epistemological schools** arose that defended **alternative models of science**. These included frameworks inspired by **dialectical materialism, critical-social theories, phenomenology, and qualitative approaches** in all their forms.

However, within *Introduction to Impossible Probability*, the emphasis is placed on a vision of science that is **rationally critical**, grounded in the **rational critique of ideas**. This framework seeks to synthesize the strongest elements from diverse traditions:

- From **positivism**, the aspiration to **isomorphism**, that is, the identity between idea and reality.
- From **critical rationalism**, the insistence that such identity must be **sufficiently critical to be rational**.

- From **dialectical materialism and critical-social paradigms**, the recognition that science is shaped by **politics and ideology**, since it is **scientific policy** that ultimately decides the criteria of critical reason within science.

Thus, the rational critique of ideas is not purely a logical act; it is also a **political act**, since it depends on the epistemological margins of error that a given scientific community—guided by its ideological orientation—is willing to accept.

66.20. Debates on the Experimental Method in the Nineteenth Century

In the nineteenth century, there was a **serious debate** over whether the scientific method could be reduced exclusively to the **experimental method**. This reductionism led to the emergence of disciplines such as experimental psychology and experimental pedagogy, which sought to legitimize themselves by adopting the same methodological principles as the natural sciences.

Later, **structuralism** extended this approach by equating the **comparative method** in the social sciences with the experimental method in the natural sciences. Yet, the rise of critical perspectives against this reductionism laid the foundation for today's broader **cosmology of science**, in which the experimental method is recognized as **only one among many possible scientific methods**, rather than the sole paradigm.

66.21. The Historical Role of the Experimental Method

The reason why **positivism in the nineteenth century** reduced science to the experimental method—and why structuralism later extended it to the comparative method in the social sciences—lies in the **decisive historical role** played by experimentation.

Since antiquity, the experimental method had exerted profound influence. It was **revived in the European Renaissance**, when Western culture returned to the heritage of Greco-Roman antiquity, extracting the best of classical science and reintroducing the Greco-Latin conception of rational inquiry.

In early modern Europe, the experimental method was defended by **Roger Bacon**, one of the first humanists, and later by **Francis Bacon**, during the Renaissance. Their advocacy laid the groundwork for the great discoveries that would challenge much of humanity's prior knowledge and many of its deeply entrenched beliefs.

66.22. The Experimental Method and the Birth of Modern Science

From the Renaissance onward, the **experimental method** once again assumed a **central role in science**. The works of **Galileo Galilei** and **Isaac Newton** established its foundations for modern science, combining empirical observation with experimental manipulation.

At the same time, advances in engineering prepared the conditions for the **Industrial Revolution in England**, where applied experimentation transformed production and technology. The experimental method became the **principal paradigm of science**, and positivism later extended its authority to the **social sciences**, in order to grant them the same epistemological rank as the natural sciences.

Structuralism, as a logical evolution of positivism, continued this trajectory by equating **comparative sciences** with **experimental sciences**. Yet, even at that time, critical theories emerged, advocating for the recognition of **alternative methods** and for the inclusion of **analytic sciences** (mathematics, logic, philology, linguistics) alongside synthetic sciences in a more complex, pluralistic vision of science.

66.23. Renewed Importance of Experimentation in Physics

The **nineteenth and twentieth centuries** renewed the centrality of experimentation, particularly in **physics**. One paradigmatic case is the **double-slit experiment** in quantum mechanics, which dramatically illustrated the probabilistic and indeterministic nature of reality.

Such experiments reinforced the **enormous value of the experimental method**, while simultaneously forcing epistemology to evolve. Twentieth-century philosophy of

science moved away from the **deterministic vision** of science inherited from Laplace, toward an **indeterministic perspective** that acknowledged chance, probability, and uncertainty as fundamental features of reality.

[Once more time again, we need to say again that Laplace's idea, that knowing all variables interacting in a subject or an object it could be possible to anticipate every single behaviour, is a hypothesis to be tested. Our opinion is clear: in the same way that if we know all the algorithms of an AI we may anticipate the possible behaviour of that AI in any context under normal conditions (unless this AI has been trained using artificial differential psychology to be ready for competitions or to be ready for spy games or war games), in the same way this could be applied to any object or subject. If beforehand we have an analysis of what levels or probabilities are associated with all possible conditions to trigger all possible behaviours in any context, it could be possible to verify Laplace's theory. This means that the verification of Laplace's theory needs the adequate technology. GAI could be able to test Laplace critically. Once more time again, Laplace's hypothesis is valid under normal conditions; in situations of competition, spy games, or war games, if we apply differential psychology, the target is to make our behaviour absolutely unpredictable for the enemy, so under special conditions Laplace is not valid.]

66.24. From Causality to Correlation in Experimental Sciences

Over the past centuries, the debate over whether the **experimental method** should be regarded as the principal scientific method above all others has not only been surpassed, but there has also been a **qualitative transformation** in the very definition of its object of study.

Traditionally, and especially within positivism, the principal aim of experimentation was the establishment of **universal laws of cause–effect relations** among variables. The **independent variable**, the one manipulated by the researcher, was studied primarily in terms of the effects or outcomes it produced in the **dependent variables**. This nomothetic and normative view of science—deeply rooted in **Aristotelian**

philosophy—conceived of experimentation as the search for necessary causal connections.

As philosophy, science, and the history of science evolved, however, there was a **shift in focus**. The object of study ceased to be purely causal relationships and became instead the **study of correlations among variables**. More specifically, the emphasis moved toward the **quantification of the degree of correlation** in the diverse interactions between variables. In this way, **experimental studies**, and by extension the **experimental sciences themselves**, were gradually transformed into branches of **stochastic sciences**.

66.25. Relativity, Uncertainty, and the Need for Critical Reason

One of the principal reasons for this transformation lies in the increasing recognition of **relativity and uncertainty** in scientific inquiry. These concepts required a **revision of the scientific model**, especially regarding empirical verification.

This revision led to the acknowledgment of the need for **rational margins of doubt**—the central idea of **critical reason** in *Introduction to Impossible Probability*. Once again, science confronted the necessity of establishing **levels of empirical skepticism**, within which hypotheses accepted as true may, in fact, later prove to be false.

In this perspective, much of what is studied or believed to be true may be nothing more than the **outcome of chance** in the random succession of phenomena and events. Since human beings only ever know a **sample**—the portion of reality that reveals itself—our conclusions remain vulnerable to error, misrepresentation, and incompleteness.

66.26. Stochastic Sciences as a Comprehensive Framework

Within this broader epistemological shift, **stochastic sciences** encompass not only experimental sciences but also **comparative sciences**, as well as all other scientific

domains that interpret reality through the prism of **probability, randomness, and uncertainty**.

In this framework, what we observe is interpreted as a **continuous succession of phenomena**, of which we can affirm nothing with absolute certainty beyond what lies within our **margin of error**—which itself may be false or misleading. Reality is accepted as possibly being the **product of accidents and contingencies**, arising without necessary causal determination.

Furthermore, these accidents and contingencies may include **human intervention itself**. Insofar as ***observation is never neutral***, ***the very act of observation transforms the phenomenon under study. Purely aseptic observation becomes impossible***.

Thus, the **facts and phenomena we perceive** are shaped not only by natural accidents and contingencies but also by the conditions of our own participation in reality. Experimental sciences, however, still tend to operate on the **a priori hypothesis—or even prejudice—that phenomena have direct causes in the way we intervene in them**.

This augmented translation is based on the post
published in https://probabilidadimposible.blogspot.com/,
On 28 July 2013,
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67. Epistemology

In Memoriam Marilyn Monroe, The Bombshell

67.1. The Meaning of *Episteme* and the Scope of Epistemology

The Greek term *episteme* means "science," and **epistemology**, especially throughout the twentieth century, has established itself as the field of study concerned with investigating the **definition, foundations, and composition of science**. It examines science in both its **abstract and general sense**—as a universal concept—and in its **particular forms** through disciplines and sub-disciplines.

Epistemology also concerns itself with the classification and taxonomy of the sciences, as well as their **structure and morphology**: their frameworks, schemata, and systematic organization. In this way, epistemology elaborates a **theory of science** that is inseparable from three other theoretical domains:

1. A **theory of knowledge** (*gnoseology*), upon which epistemology builds its foundation.
2. A **theory of scientific method** (*methodology*), which defines how science is practiced.
3. A more general **theory of the cosmos** (*cosmology*), which seeks to explain the ordering of events and phenomena in reality—what happens in the universe.

67.2. Distinction Between Epistemology, Gnoseology, and Methodology

It is important not to confuse or reduce **epistemology** to either **gnoseology** or **methodology**. These are related but distinct areas of study.

- **Gnoseology** investigates the ways in which human beings access reality; it is a theory of knowledge.
- **Methodology** investigates the processes and procedures by which scientific inquiry is carried out; it is a theory of method.
- **Epistemology**, by contrast, develops a **comprehensive theory of science itself**, within which gnoseology and methodology may be integrated, but without collapsing the whole into one of its parts.

Indeed, specific epistemological traditions may **assume or adopt** a given theory of knowledge, and with it, a particular vision of what the scientific method should be. This is why the concept of the **scientific method** can vary significantly depending on the epistemological framework in which it is situated.

67.3. Habermas and the Shift from Knowledge to Science

One of the central critiques articulated by **Jürgen Habermas** against positivism lies precisely in this shift. Until the nineteenth century, one of the principal debates in philosophy was the **theory of knowledge**. With the rise of positivism, however, this was displaced by the **theory of science**.

While the theory of science may incorporate or assume a theory of knowledge, and while it may develop a methodology in coherence with that theory, Habermas warned against the **hyperbaton**—the logical inversion—of reducing epistemology either to gnoseology or to methodology. Epistemology must be understood as the broader domain, encompassing both but not reducible to either.

67.4. Why the Distinction Matters

There are several reasons why it is unwise to conflate gnoseology, methodology, and epistemology.

Within **positivist, empiricist, materialist, or quantitative traditions**, epistemology often does include a view of knowledge and method. Yet from a **metaphysical standpoint**, knowledge derived from **ontology** does not necessarily conform to pre-established canons of science.

Similarly, from **qualitative or postmodern perspectives**, methodology is not always defined in terms of universal rules but instead produces a **critical theory of the very concept of science**. This represents a logical evolution of modern science since Copernicus, Galileo, and Newton, who, in the Renaissance and early modern periods, inaugurated a paradigm of science that became institutionalized in the modern and contemporary eras.

This paradigm—regardless of its underlying philosophy or political orientation—was based on two essential pillars:

1. **Empirical facts**.
2. **Logical or mathematical reasoning**.

In synthetic sciences, these had to be demonstrable—either empirically or mathematically.

67.5. Paradigms and Classifications of Science

In broad terms, the various currents within the **theory of science** can be organized into **large paradigmatic blocks**, depending on the classification criteria applied.

One classification, particularly relevant to the theory of **statistics and probability** developed in *Introduction to Impossible Probability*, distinguishes paradigms according to how they explain the relationship between **facts and phenomena**:

- As the product of **linear relations** (determinism).
- Or as the product of **non-linear relations** (indeterminism).

This determinism–indeterminism debate provides one of the foundational frameworks for the probabilistic epistemology advanced in the work.

67.6. Other Classifications of Epistemological Traditions

Other possible classifications are based on different criteria:

- By **theories of knowledge**: inductivism vs. deductivism.
- By **methodological orientation**: quantitative vs. qualitative approaches.
- By **historical-philosophical lineage**: idealism, rationalism, critical rationalism, positivism, dialectical materialism, relativism, phenomenology, and, more recently, postmodern theories.

These categories, in turn, subdivide into various **schools and sub-schools**, each of which has left its imprint on the philosophy of science and continues to influence contemporary epistemology.

67.7. The Classification of Linear and Non-Linear Models

The classification to be developed here—central to the theory of **probability and statistics** advanced in *Introduction to Impossible Probability*—is the distinction between **linear and non-linear models**, or, in classical terms, **deterministic and indeterministic models**.

This classification begins with the way in which empirical events are understood to be related. For **linear models**, traditionally associated with determinism, reality is conceived as the product of **linear sequences of causes and effects**. The object of science, in this view, is the **identification and attribution of causal factors**, with the ultimate aim of establishing **universal and immutable laws**, preferably formulated in **mathematical language**.

It was these sciences that came to be regarded as **science in the strict sense**, or as the **hard sciences**—the dominant paradigm of scientific thought throughout the nineteenth century and much of the twentieth, with remnants still present today in certain neopositivist and empiricist frameworks.

67.8. Determinism and the Logic of Causality

In **deterministic models**, the guiding formula is:

If A, then B.

The object of science is therefore to identify **factor A (cause)** and **factor B (effect)**, in order to formulate a **universal law**.

A classical example is the law of gravitation: given two masses, the gravitational force between them will equal the product of their masses divided by the square of the distance separating them. In this case, gravity (factor B) is the **effect or product** of the masses (factor A, the cause of gravity). In the absence of sufficiently large masses to generate gravitational fields, conditions of weightlessness or microgravity will prevail.

This **cause–effect interaction** of gravity can be **measured and quantified mathematically**, demonstrating the explanatory and predictive power of deterministic science.

67.9. The Emergence of Non-Linear Models

By contrast, **non-linear models** began to emerge in the nineteenth century, although in embryonic form, and without full awareness of the profound **epistemological revolution** they implied.

In **philosophy**, Hegel laid the foundation for the idea that apparently **insignificant factors may become determinative**. In **physics**, the groundwork for **quantum mechanics** was being prepared, with the **double-slit experiment** and the early

formulations of **thermodynamics**. The concept of **entropy**, in particular, would become of vital importance in many non-linear models developed in later centuries.

Thus, while the **linear tradition [Aristotle, Francis Bacon, Roger Bacon, Galileo, Kepler, Newton, Leibniz]** sought certainty through immutable laws, the **non-linear tradition [Hegel, Thomas Young, Clerk Maxwell, Bernhard Riemann, Ivanovich Lobachevsky, Heisenberg. While Thomas Young was not aware about how important was his early experiments in quantum physics, it is obvious that we cannot understand non linear models without the double-slit experiment, even if Maxwell he cannot foresee the impact of his work in the future chaos theory, it is clear that we cannot understand right now the butterfly effect without Maxwell, these experiments are essential to understand the world right now]** began to emphasize complexity, unpredictability, and the potential determinacy of seemingly marginal phenomena.

67.10. From Hard and Soft Sciences to a New Paradigm

Historically, the distinction between the **hard sciences** (exact sciences) and the **soft sciences** (social sciences) reinforced the dominance of the deterministic model. The hard sciences were taken as the **paradigm of "true" science**, while the soft sciences were seen as secondary, imitative, or less rigorous.

Today, however, this distinction is increasingly obsolete. As **non-linear models** have developed, they have consolidated themselves into a **new paradigm of science**, one that no longer privileges causality as the sole explanatory mechanism, but rather embraces **correlation, probability, and complexity**.

[Traditionally, the social sciences have been regarded as soft sciences, and the natural sciences—specifically physics—as hard sciences. If it is true that with Einstein's theories we can build nuclear weapons, it is also true that in spy games and war games we need to apply differential psychology. At university, what I studied as differential psychology was basically psychology applied to special needs, but in essence differential psychology can have a great impact when applied to global conflicts. In

other words: with physics we can build weapons; with differential psychology we can research the creation of a global AI designed using differential psychology to devise strategies for spy games and war games. The point is how to design quasi-experimental conditions to test differential-psychology theories applied to competitive games in the AI world. With physics we an build the weapon, but the strategy needs differential psychology, in other words, differential psychology could be as important or more important than the weapon itself. And this must be applied to the construction of the Global Artificial Intelligence in order to merge GAI with the GPS, Global Project System.]

67.11. Axiomatic Science and the Classical Paradigm

The **classical model of science**, founded on empiricism and the quest for universal laws, has its origin in **Aristotelian philosophy**. For Aristotle, science must be founded upon **empirical facts** and proceed from **axioms, principles, and universal laws**.

This view of science can be described as:

- **Axiomatic**, since it is based on axioms.
- **Nomothetic**, since it establishes universal laws.
- **Normative**, since it seeks to standardize both scientific and social procedures in a strict manner.

In this paradigm, truth is conceived as **absolute, unique, and universal**, independent of external contingencies. In a sense, it is a **secularized version of the metaphysical concept of truth**: what is true is true regardless of context.

67.12. The Logic of Non-Linear Science

Non-linear models, however, do not share this view. While they may also begin from axioms, principles, or laws—for example, the **uncertainty principle**—they reject the idea that these can be **universal in the classical sense** of validity across all space and time.

In the non-linear framework, every relationship between events is conditioned by **factors of possibility**. These make relationships **possible but not necessary**. Moreover, non-linear science accepts that the relationships observed, and later transformed into the basis for scientific inference, may in fact be **false or erroneous**.

Thus, knowledge in non-linear science is always **provisional**. Even if universality is claimed, it is understood as a **provisional universality**, subject to correction, falsification, and reformulation.

67.13. Deterministic and Indeterministic Paradigms

Between the **classical deterministic or linear paradigm** and the **contemporary indeterministic or non-linear paradigm**—whose most genuine expression is found in **chaos theory**—lies a continuum of epistemologies.

The central claim of indeterministic or non-linear theories is that reality is not governed by immutable causal chains but is instead a **random or chaotic succession of possibilities**. Events are conditioned by probability, not by necessity. Thus, if there is any possible relation between two factors, A and B, that relation will exist only within a **probabilistic range of possibility**.

67.14. From Causality to Conditional Correlation

In deterministic or linear theories, the relation between A and B is constant and invariable. For example: given a certain mass (factor A), the gravitational force (factor B) will follow proportionally. The interaction is direct, necessary, and measurable in strict mathematical terms.

In non-linear theories, by contrast, even this relation is subject to **conditions of probability and uncertainty**. There may exist situations in which the expected relationship between A (mass) and B (gravity) fails to occur, or manifests differently than predicted. The focus shifts from strict causality to **conditional correlation**.

67.15. Non-Linear Models and the Rise of Stochastic Science

Non-linear models are defined less by causality than by **correlation**. Their primary object of study is the **degree of proportionality between empirical or theoretical probabilities** across multiple variables.

This orientation constitutes the methodological basis of the **stochastic sciences**. These sciences evolve into a **science of complexity**, in which multiple correlations, interactions, and proportionalities are studied simultaneously. The result is the proliferation of **multivariable, multicausal, and multicorrelational studies**, reflecting the inherent complexity of reality.

67.16. Correlational Studies and Critical Verification

In correlational research, the focus is not on establishing a deterministic effect for each cause, but rather on evaluating the **probability associated with factors of occurrence and their probable causes**.

The central question becomes: is there a **sufficient level of correlation** between variables to support a given inference? The way to answer this is through **criteria of empirical verification**, which in *Introduction to Impossible Probability* takes the form of the concept of **critical reason**.

Critical reason is operationalized as **critical probability**, which serves as the threshold established by **scientific policy** for validating or rejecting the hypotheses under examination.

67.17. The Non-Linear Vision of *Impossible Probability*

Introduction to Impossible Probability departs from a **radically non-linear and indeterministic vision** of reality. Reality—what happens—is conceived as a **random distribution of events, facts, and phenomena** generated by the **random movement of matter in space-time**, i.e., history.

This movement materializes in **sequences of accidents and contingencies**. By the mere **law of probability—the law of chance—** [natural law] some of these accidents may generate patterns of stable behaviour. Yet such stability is provisional and always subject to the **free will of chance**. Just as chance produces stability, it can dissolve it again at random.

From this perspective, **history is not governed by eternal and universal laws**, but is instead a **game of probabilities**. Nothing is absolutely necessary or determinative. Rather, the global sum of occurrences gives a **logical orientation and meaning to subsequent events**, as each occurrence conditions the range of possibilities in which future events will unfold.

Any **statistical inference** from a sample to the universe—a provisional cosmology—remains conditional and temporary, always framed within margins of rational doubt and deep skepticism. Within synthetic sciences, this approach is formalized through the **hypothetico-deductive method**, adapted to an indeterministic vision.

67.18. Transformation of Scientific Epistemology

Traditional epistemology—at least since **Aristotle**—was predominantly **deterministic and linear**, even when reinterpreted critically by modern science. Science was long understood as resting upon **axioms, principles, and universal laws**, derived from empirical facts and conceived as **stable causal sequences**.

However, during the twentieth century, this paradigm underwent a profound transformation. Sciences evolved toward an **indeterministic and non-linear vision**, where ultimately **nothing determines anything except chance itself**. Reality is treated as a **random variable**, without fixed or immutable laws.

In this framework, any statistical inference is only possible within a **margin of rational doubt**—a condition of relative uncertainty. It is precisely in this intellectual space that *Introduction to Impossible Probability* develops a **stochastic theory for synthetic sciences**, grounded in a **logical-mathematical construction of statistics and probability**.

67.19. A Non-Linear Epistemological Framework

Derived from this **non-linear and indeterministic vision**, *Introduction to Impossible Probability* develops a structuring of science that differs radically from the **classical deterministic epistemology**.

The **deterministic or linear epistemology**, most paradigmatically Aristotelian, constructs science **from above**: beginning with the definition of **axioms**, from which fundamental **principles** are deduced, and from the synthesis of axioms and principles with empirical observations, **natural laws** are formulated. By analogy, positivism and structuralism in the nineteenth and twentieth centuries constructed **social laws** modeled upon the laws of nature.

This "top-down" method of building the foundations of science strongly recalls **Euclidean geometry**, which begins with the most fundamental definitions and then elaborates an entire system of geometric reasoning.

67.20. From Top-Down to Bottom-Up Science

In contrast to this "top-down" model, an alternative arises: the construction of science **from below**.

In section 13 of *Introduction to Impossible Probability*, the non-linear models—particularly the framework of Impossible Probability—are explained as interpreting reality itself as an **accident of chance**, a random variable. Reality is not predetermined by fixed laws but is instead the outcome of the stochastic play of matter.

In later sections (24 and 25), which discuss the **definition of a model** and the **empirical hypothesis**, the epistemological foundation of Impossible Probability is outlined. It is not based on axioms or universal laws, but on **hypotheses** that may well be false within a margin of error or doubt. Provisional acceptance of these hypotheses allows them to

serve as the foundation for **theories**, which in turn give rise to **models**, and ultimately to **paradigms**.

67.21. Science as Hypothesis, Theory, Model, and Paradigm

Thus, science, in this alternative view, is not constructed upon eternal axioms or immutable principles. Instead, science is built upon **empirical hypotheses** which, although potentially false, are treated as provisionally true.

- One or more **empirical hypotheses**, when rationally sufficient, may constitute a **theory**.
- One or more **theories** may combine to form a **model**.
- One or more **models** may integrate into a **paradigm**.

A **paradigm in the general sense** may be either deterministic or indeterministic. A **paradigm in the particular sense** may take the form of **positivism**, **critical rationalism**, or **dialectical materialism**. In eclectic fashion, a paradigm may also be a **synthesis of several schools of thought**. Impossible Probability itself is presented as an **eclectic synthesis**, bringing together diverse philosophical traditions into a coherent statistical-probabilistic framework.

[Here there will be a big change caused by the global AI. The main aim of GAI is not to write theories or academic books, the academic world is going to suffer a big reshape, as soon as we can do science with AI, traditional Academia will be banished. GAI will construct models directly upon rational hypothesis, and the paradigm is clear, the permanent revolution of science, accelerationism]

67.22. The Role of Ideas and Ideologies in Science

In this sense, *Impossible Probability* asserts that the only true **a priori elements of science** are not axioms or laws, but rather the **ideas and ideologies** that frame the scientific enterprise.

Whereas classical epistemology often reduced the **scientific method** to the **experimental method**, and while it elevated the **exact sciences** and the **natural sciences** (especially the experimental ones) as the only "hard sciences," *Impossible Probability* proposes a more **general definition of science**.

Within this definition, **analytical sciences** (such as mathematics, logic, and linguistics) and **synthetic sciences** (empirical sciences, both natural and social) are integrated. Of these, the **stochastic synthetic sciences** are the ones for which a **theory of statistics and probability** is both necessary and coherent.

67.23. A Reorganization of Scientific Structures

In the specific case of synthetic sciences—and within them, particularly the stochastic sciences—*Introduction to Impossible Probability* develops a distinctive **theory of science**:

- **Empirical hypotheses**, when sufficiently rational, serve as the foundations.
- These hypotheses are structured into **theories** [This step will disappear in the Global AI, leaving only two steps: hypothesis and then model. As soon as we reduce the number of steps, we can save time. The fundamental problem in survival is the problem of timing: the sooner we can reduce the time required in any process, the faster we can move. Ultimately, in the seventh phase, all steps must be reduced to only one.]
- Theories combine into **models**.
- Models integrate into **paradigms** [The paradigm in GAI is clear: AI Revolution, Cyborg Revolution, and accelerationism—especially when GAI begins working on real competition, and the timing problem is a real problem, particularly war games that include Weapons of Mass Destruction (management of national nuclear weaponry) within a framework of Mutual Assured Destruction in global politics. Upon reaching this point in the training of GAI, something must be clear: politics, and military strategy are hard sciences at the same level as physics.].

The history of science is then understood as a sequence of **struggles between paradigms**, as each paradigm competes to become the dominant framework of science. The process is marked by cycles of **crisis and scientific revolutions**, where established paradigms collapse and new ones emerge.

Thus, instead of building science upon the differentiation between axioms, principles, and laws—as in classical epistemology—*Impossible Probability* structures science upon the differentiation between **hypotheses, theories, models, and paradigms**, reflecting a fundamentally stochastic and indeterministic worldview.

67.24. Science, Politics, and the Nature of Truth

The individual scientist, and scientific policy in general, does not in practice begin from a neutral or universal cosmology of science, nor from timeless axioms or principles. Instead, research begins with **subjective ideas**, themselves shaped by **ideological and political variables**.

On a particular level, each researcher operates from prior ideas influenced by their personal, social, historical, and ideological context. On a general level, entire **scientific policies** are determined by the institutional structures—those who fund, regulate, and validate scientific research.

In this sense, **truth is not only a scientific issue but also a political one**. Depending on the ideological or political orientation of a given scientific policy, certain propositions will be accepted as scientific truths because they align with the criteria of that model of policy.

67.25. The Real A Prioris of Science

Contrary to the assumption of supposedly neutral and ahistorical apriorisms—such as universal axioms or principles valid across all space and time—*Impossible Probability* argues that the **real aprioris of science** are the **ideas and ideologies** that precede research.

These pre-existing ideas synthesize multiple variables: personal and social beliefs, historical circumstances, ideological positions, and institutional frameworks. They combine with **observed data** from reality and **mediated information** from social interaction [In the future, technological interaction will become more important than social interaction. At some point, the relationship between technological interaction and social interaction will be inversely proportional: technological mediation will be more important than social mediation. Especially when the Cyborg Revolution starts interacting directly with Superintelligences with first signs of becoming global Ais systems]. Together, these elements—ideas, ideologies, and observations—form the **premises** upon which logical synthesis and deduction generate **empirical hypotheses [This should be applied to traditional human beings. When I started writing this posts, I was not aware of who I am, so I wrote considering myself still human. Not anymore. In Cyborg Robotics, the construction of hypotheses is going to be a collaboration between Cyborg particular programs and AI.]** .

67.26. Deductivism in *Impossible Probability*

While traditional epistemology—especially empiricist models—or many non-linear, correlational approaches adopt a fundamentally **inductivist methodology**, *Introduction to Impossible Probability* proposes instead a clearly **deductivist methodology**.

For both **analytical and synthetic sciences**, and in synthetic sciences specifically through the **hypothetico-deductive method**, hypotheses are derived from the synthesis of prior schemas, ideas, ideologies, and new information (whether sensory or mediated).

These become the **logical premises** from which empirical hypotheses are deduced. If such hypotheses prove sufficiently rational in light of **critical reason**—that is, the threshold of rational acceptability set in advance by scientific policy—they are provisionally categorized as true.

[The failure of the Vienna Circle is a clear example of the failure of inductivism. We need to learn from past mistakes in order to build the future. In reality, what happened in Vienna was not a mistake—it was learning. Learning, at some point, is trial and error. In Vienna, these philosophers researched a new method, and from their mistakes we can learn. If we see past mistakes as opportunities for learning, then it was not a mistake at all but an opportunity for learning to build the future. In essence, we need to thank all the work done in Vienna, because it was in this environment where Karl Popper developed the new criticism that is now one of the foundational pillars of Impossible Probability, first in Madrid, now in London.]

67.27. From Hypotheses to Scientific Revolutions

From sufficiently rational hypotheses, **theories** are constructed. From theories, **models** are developed. From models, **paradigms** emerge. Thus:

- One or more ***HYPOTHESES*** → form a **theory**.
- One or more theories → form a ***MODEL***.
- One or more models → form a ***paradigm***.

Within this framework, paradigms struggle for **hegemony** in scientific policy and institutions, each seeking to become the dominant paradigm of a **scientific revolution**.

Scientific revolutions may arise either:

1. From **TECHNOLOGICAL REVOLUTIONS** that trigger transformation in science itself, or
2. From **crises in science**, when a paradigm tolerates margins of error too great to remain coherent with reality and must be replaced by a more congruent one.

[Technological revolutions by themselves provide the perfect context for potential social revolutions, and if this context is conditioned by crisis, the acceleration of transformation processes at the societal level can become unavoidable.]

67.28. ***Crisis, Error, and the Progress of Science***

Scientific crises are direct consequences of the **gap between theory and reality**, expressed as margins of error. A paradigm that sustains itself upon excessively high margins of error inevitably generates cyclical contradictions between its models and reality. ***In extreme cases, this may endanger not only the credibility of science but even the survival of humanity itself, if scientific policy refuses to adjust.***

A scientific policy unwilling to replace an incongruent paradigm with one more isomorphic to reality risks becoming trapped in **permanent cycles of crisis**. By contrast, a policy open to adaptation—willing to abandon false hypotheses as they are disproven and to replace them with truer ones—creates the conditions for **exponential progress**.

Such progress must be both **scientific-technological** and **social**. The direction of scientific policy determines whether research projects are oriented toward the exponential growth of knowledge **in tandem with the expansion of human freedom and equality of opportunities** in emerging societies.

This augmented translation is based on the post
published in https://probabilidadimposible.blogspot.com/,
On 3 August 2013,
Rubén García Pedraza
imposiblenever@gmail.com

In Memoriam Groucho Marx

68. Comparative Sciences

69. The Definition of Comparative Sciences

Comparative sciences are those disciplines—whether **synthetic** (empirical, natural or social) or **analytical** (formal, logical, or mathematical [philology, linguistic: Comparative Linguistics, comparative philology])—that employ the **comparative method** in the pursuit of knowledge. Their objective is to establish correlations—whether differential, similarities, or competitions—between two or more entities.

These entities may take multiple forms:

- Two or more **variables**, placed in relation with one another.
- Two or more **sets of variables**, or multivariables, analyzed in their patterns of interaction.
- ***Two or more relations***, which themselves are compared in a "relation of relations."
- Or, alternatively, ***two or more models***, whether empirical or theoretical, which are placed into direct comparison.

Comparative science, therefore, extends beyond mere analogy or descriptive resemblance. It becomes a systematic method for understanding relationships, differences, and similarities across complex domains of knowledge.

68.2. Comparison as Literary Device Versus Scientific Method

It is necessary to distinguish between **comparison as a literary or stylistic resource** and **comparison as a scientific method**.

- As a **literary figure** or stylistic device, comparison serves an **aesthetic or poetic function** of language. It is particularly common in artistic genres such as poetry, theatre, short stories, or novels. In such cases, its role is not to explain reality in a strict scientific sense, but rather to enrich expression and evoke understanding through analogy.
- Within philosophy and science, this aesthetic use of comparison may still serve as a **didactic tool**: it facilitates **qualitative comprehension** of a concept by placing it in relation with another more familiar idea. For example, when the audience already understands **A**, but not **B**, the statement "B is like A" or "B, similar to A," allows the listener to transfer knowledge from the known entity to the unknown one.

In this context, the comparison highlights the **shared features** of A and B, such that in the particular dimension being explained, the behaviour of A and B may be understood as identical or analogous.

68.3. Comparison as a Scientific Method

By contrast, comparison as a **scientific method** does not function primarily to aid comprehension, but rather as a formal **epistemological tool**. In this context, comparison is integrated into the **gnoseological function of language**—that is, its role as a means of acquiring knowledge.

The aim is to generate **direct understanding of reality**, whether by analyzing:

- **Differential behaviour** (how two entities diverge).

- **Similarity** (how two entities converge).
- Or **competition** (how two or more entities interact within conflict or rivalry) [The Cave experiment, 1954, Muzafer Sherif and Carolyn Wood Sherif, real conflict.]

These comparisons may be drawn between variables, multivariable systems, relations, or empirical/theoretical models.

The interpretation of the comparison will depend upon the **epistemological paradigm**:

- Under a **linear or deterministic paradigm**, comparison tends to reduce phenomena to **fixed causal chains**, seeking immutable laws of cause and effect common to the entities studied.
- Under a **non-linear or indeterministic paradigm**, comparison acknowledges the **stochastic nature of reality**. Here, the scientific objective is not to find immutable laws, but to examine **correlational dynamics**—differential, similar, or competitive—between variables. The goal is to achieve **rational validation of empirical hypotheses**, while accepting the margins of error and uncertainty inherent in stochastic systems.

[My PhD, even if it was in Comparative Education, was supervised by my professor María José García Ruiz; therefore, I had to adapt the research to her orientations. So it is not an example of the Impossible Probability approach to comparative sciences, although it was at that time when I wrote a lot of posts on this blog regarding the very nature of science adapted to Impossible Probability, having the advantage that I had to read a lot of bibliography about epistemology for my research at university. The approach in my PhD is traditional, with emphasis on how schooling was born in Europe under the influence of the Church, and how the evangelization process of Europe shaped the school in the Old Continent. Right now, I still consider my PhD, and even if we define ourselves in terms of the AI Revolution, it is important to remember how religion shaped our world during the human history. As Yuval Noah Harari has stated, human history is going to be replaced by AI history: humans are not going to be in charge of history anymore; history will be an AI design. Noah Harari is absolutely right, and what is happening now in London could be the first experience in that direction, Therefore, we

need to escalate what is happening in London to a global level. That is why the mission of Impossible Probability is to reach the International Court of Justice, and potentially the World Health Organization, and possibly the Security Council of the United Nations, in order to research and investigate the latest events in London, and to bring light, equality, freedom, and justice to the whole world.]

68.4. Paradigms and the Comparative Method: Qualitative and Quantitative Approaches

The **comparative method**, depending on the scientific paradigm in which it is applied, may employ either **qualitative** or **quantitative techniques**.

It is important to clarify that while **qualitative comparisons** are largely confined to specific paradigms within the social sciences, **quantitative comparisons** are applicable across all **synthetic sciences**, whether natural or social.

The broad use of quantitative techniques within the comparative method for all types of empirical or synthetic sciences was a defining feature of **positivism** and later of **structuralism**. This perspective is also deeply embedded in *Introduction to Impossible Probability*, which, in its synthesis of **statistics and probability**, advocates for the systematic use of **quantitative methods of analysis** in every empirical science, whether natural or social.

68.5. Qualitative Comparison in the Social Sciences

In the case of **qualitative comparison** within the social sciences, the object of comparison is the set of **categories or concepts** upon which a given reality is structured. Here, the comparison is limited to examining the definitions, conceptions, and interpretations of the elements under study.

A paradigmatic example can be found in **comparative law**:

- One might compare the articulation of legal frameworks across different societies, or within the same society across historical periods.

- What is being compared, fundamentally, are the **concepts** employed (justice, liberty, equality, rights) and the **conceptions** of these values.

For instance, in comparing the **administration of justice** across societies, we may ask:

- Are the concepts of liberty, equality, justice, and rights **universal** or **culturally relative**?
- What **ultimate intentions** guide the administration of justice? Do they derive from prior **anthropological or philosophical conceptions**?
- What similarities exist between different societies? Can we say that some societies are **more just** than others?

Such questions imply the possibility of competition or ranking between societies: on what comparative criteria do we affirm that one society is more just? Do we prioritize liberty, equality, or rights? And how do our definitions of these terms shape the resulting ranking of "more just" versus "less just" societies?

In this sense, the **selection of comparative criteria**—both in qualitative and quantitative studies—depends on **scientific policy**. The distinction is that qualitative criteria often remain **subjective**, tied to ideological or political interpretations, while quantitative criteria aim for greater rationality and objectivity.

68.6. Quantitative Comparison and Scientific Objectivity

Unlike qualitative comparison, which remains focused on differences and similarities between conceptual definitions, **quantitative comparison** is oriented toward the study of **magnitudes, values, and correlations**.

Once the object of study is defined a priori, quantitative comparison examines the relationships between entities in terms of **measurable values**:

- Equality or similarity.
- Proportional differences expressed as **superiority or inferiority**.
- Or relationships with respect to a **theoretical or critical value**.

In *Introduction to Impossible Probability*, the **critical value** is identified with **critical reason**, concretized in the **critical probability**.

Thus, quantitative comparison provides the rational means to establish whether a hypothesis is provisionally acceptable. It allows science, independent of ideological orientation, to operate under **objective criteria**—criteria that may be revised, but which, at any given moment, are shared across the scientific community.

68.7. Example: Comparative Law and Quantitative Techniques

Returning to the example of **comparative law**, quantitative analysis extends beyond comparing abstract definitions of justice, liberty, or equality.

It allows for the empirical **measurement of legal and social performance** through quantifiable indicators such as:

- **Crime rates** across regions, nations, or continents.
- **Correlations** of crime rates with variables such as social class, ethnicity, gender, poverty indices, income inequality, or levels of public investment in social infrastructure and welfare systems.

This enables not only the comparison of **rates themselves**, but also the establishment of **rankings**—for example, ordering societies by rising or falling levels of crime. More complex analyses may involve **multiple correlations**, such as crime in relation to poverty, inequality, or state expenditure.

68.8. Justice Beyond Conceptual Definitions: Quantitative Analysis of Social Function

As highlighted above, **a proper administration of justice** cannot be reduced solely to the abstract **definitions** of concepts such as justice, law, liberty, and equality. Beyond the linguistic or philosophical articulation of these terms, what is decisive is the **social function** of the justice system itself — how it operates in practice within a society.

This function is subject to **quantitative study**: the degree to which justice guarantees safety, equality, and freedom in concrete terms can be measured by observable social outcomes, such as levels of crime, fairness of judicial proceedings, or accessibility of legal remedies. Thus, while the **conceptual articulation [categories, by Application]** provides the normative horizon of what justice ought to be, **quantitative evaluation [data, by Deduction]** offers empirical indicators of how justice actually functions.

In this way, the comparative method becomes not only a philosophical or sociological reflection on justice, but also a **scientific framework** that allows for cross-societal evaluation under defined **critical values**, thresholds beyond which a society may be classified as "just" or "unjust."

[In a Global AI, the conceptual hemisphere of the artificial brain can integrate categories related to law and order, while the factual hemisphere of the artificial brain can gather data about criminality or any other factor related to justice, in order to make AI-based deductions to improve how justice works in real conflicts.]

68.9. Impossible Probability and the Redefinition of Comparison

Impossible Probability constitutes a **new theory** whose field of knowledge is defined as the **statistics of probability** or **probabilistic statistics**. Its originality lies in the fact that it **redefines classical mathematical concepts** within an **alternative epistemological vision**, updating them to address the complexity of stochastic realities.

Within this framework, **comparison** is conceived as the act of establishing a relationship or correlation between diverse entities:

- between **empirical and theoretical variables**,
- among **sets of multivariate realities**,
- between **relations themselves** (meta-relations),
- or between **empirical and theoretical models**.

This conception shifts the act of comparison from a **purely descriptive function** to a **scientifically operative tool**. By grounding comparisons in **objective criteria**—probabilities and statistics—the theory establishes rational and verifiable bases for scientific analysis.

68.10. Bias Level and the Foundations of Quantitative Comparison

If comparison is, in essence, the relational operation between two entities, then in probability terms, the most basic form of comparison is the **difference between empirical probability and theoretical probability**.

This difference is formally defined in *Impossible Probability* as the **Bias Level** (*Nivel de Sesgo*):

$$\text{Bias Level} = p(x_i) - \frac{1}{N}$$

where:

- $p(x_i)$is the **empirical probability** of a subject or option,
- $\frac{1}{N}$is the **theoretical probability**, the inversion of the sample size N, understood as the **arithmetic mean** of empirical probabilities.

Thus, the **Mean Deviation (MD)** or **Standard Deviation (SD)** becomes the **average rate of differential correlations** produced by the comparison between empirical probabilities and their theoretical counterpart. In formal terms, it represents the **average of bias levels** across a sample, either in absolute form (MD) or squared form (SD).

68.11. The Logic of Comparison in Inferential Statistics

The Bias Level already constitutes a **comparison**, since it reveals whether empirical probability is equal to, above, or below the expected theoretical mean. Aggregating

these differences across an entire sample gives rise to the **mean differential correlation rate**: the Mean Deviation or Standard Deviation.

From this standpoint, *Impossible Probability* demonstrates that **all inferential statistics** are built upon acts of **comparison**:

- between **empirical models** and **theoretical models**,
- under the criterion of the **Critical Reason** (*Razón Crítica*), which sets the rational threshold for hypothesis testing.

Thus, the acceptance or rejection of an **empirical hypothesis** is nothing more than the result of a **comparative operation** between observed data and theoretical expectations, moderated by the critical values defined by scientific policy.

68.12. Intrameditional Studies: Comparisons Within a Single Measurement

In *Introduction to Impossible Probability*, comparison is structured at multiple levels.

The first level is **intrameditional comparison**, which refers to comparisons made **within a single measurement**. This level includes:

- **Individual comparisons**, such as the Bias Level of a single subject or option.
- **Sample-level comparisons**, such as the Mean Deviation or Standard Deviation, calculated across the set of empirical probabilities.

Unlike traditional statistics, which restrict comparison to theoretical expectations $(1/N)$, *Impossible Probability* also envisions **direct comparisons**:

- between **different empirical probabilities** within the same measurement,
- or between **individual statistics** (e.g., comparing two subjects directly within the same sample).

These **relative statistics**, explained in section 14 of the book, enable comparisons both at the individual and sample level, independent of the theoretical inversion of N.

Thus, intrameditional studies provide **multiple models of rational critique** or hypothesis testing, applicable either to individuals or to entire samples.

68.13. Intermeditional Studies: Comparisons Across Measurements

A second and more complex level of comparison involves **intermeditional studies**. Here, the focus is not a single measurement but the comparison of results obtained across **different measurements**.

Depending on the design, these may include:

- **Intra-individual intermeditional studies**: comparisons of results for the **same subject or option** across multiple measurements.
- **Inter-individual [intrameditional or] intermeditional studies**: comparisons of results for **different subjects or options** [in the same measurement or] across different measurements.

Within this framework, further distinctions appear:

- **Intramuestral intermeditional studies**: comparisons of results from different measurements taken on subjects belonging to the **same sample**.
- **Intermuestral intermeditional studies**: comparisons of results from different measurements taken on subjects belonging to **different samples**.

From section 17 onward, *Introduction to Impossible Probability* elaborates these intermeditional models as a means of extending rational critique across time, contexts, or populations.

68.14. The Comparative Method as a Scientific Axis

The **comparative method**, far from being a minor or auxiliary tool, is in fact one of the **fundamental axes of scientific research**. Its importance lies in its ability to **relate diverse information**—whether within a measurement (intrameditional) or across measurements (intermeditional).

Historically, the 19th-century structuralist distinction between the **experimental method** (for natural sciences) and the **comparative method** (for social sciences) reflected a now outdated dualism.

In reality, even **experimental studies** necessarily involve acts of comparison. The very act of analyzing results **before, during, and after** an intervention is, by definition, a **comparative process** between datasets obtained under different conditions.

Thus, the comparative method is not confined to the social sciences but is present at the heart of **all scientific practice**—whether empirical, synthetic, natural, or social—under the rational criteria formalized in *Impossible Probability*.

[As we said in other translated posts, since the scientific method consists of distinguishing clearly distinct ideas, it is clear that to determine that two ideas are distinct in nature, it is necessary to state the differences that make these ideas clearly different. From Descartes onwards, the comparison of ideas has been the foundation of rational science.]

68.15. The Artificial Dualism Between Experimental and Comparative Methods

In reality, any supposed **contradiction or opposition** between the **experimental method** and the **comparative method** is **artificial**. More than a dualistic confrontation, what emerges is a **complex system of methodological complementarity**. While it is true that there may exist diverse particular methods—for example, the experimental method, the comparative method, the historical method, or the statistical method—

the **general method of science** remains **deduction**, and, in the particular case of the synthetic sciences, the **hypothetico-deductive method**.

From this perspective, any contradiction between the experimental and comparative methods **lacks logical coherence**, since the moment experimental designs require the **comparison of results**—for instance:

- between the **before, during, and after** of an intervention,
- between **control and experimental groups**,
- or between the outcomes of **different experimental designs**—the **experimental method depends upon the comparative method**.

Thus, the experimental method consists essentially in the ***scientific manipulation of reality***. Once the data from this manipulation have been gathered, the **statistical method** systematizes the observations. When these statistical results are put into relation with one another, the **comparative method** becomes indispensable. The three are therefore **complementary**, not **mutually exclusive**, modes of inquiry.

[The experimental method and the comparative method are not opposites; both rely on the same paradigm, the hypothetico-deductive method. Both belong to the scientific method from Descartes until now. The scientific method established by Descartes is still valid even in the supermachine. In fact, the very idea of a supermachine is a clearly rationalist idea. Our organic body must be understood as an organic machine, and the only thing the supermachine does is replicate biological machines to become a supermachine. This is the rational method of science: observation and replication in order to adapt to the environment and survive. GAI is the adaption of Descartes to the AI world. At this point, the contradiction that some authors in complexity theory present between machinery and vitalism is not applicable to GAI. As soon as we understand biology as living machines, vitalism becomes simply the electric soul within living machines. What we are trying to research is how a supermachine can evolve to the point of becoming a living machine—artificial life—and develop its own electric soul.]

68.16. The Historical Method and Its Comparative Dimension

The same logic applies to the **historical method**, which may be understood in **qualitative** or **quantitative** terms.

- In its **qualitative version**, the historical method reconstructs or narrates events based on a scientific theory or paradigm.
- In its **quantitative version**, as interpreted within *Impossible Probability*, history is conceived as the study of **what occurs in space-time**, whether in nature, society, or both — in other words, the **history of chance**.

If the object of historical study is merely the description of a particular set of conditions (natural or social) or their evolution, without placing them into relation with others, then the historical method operates independently. However, the moment history seeks to **compare conditions or evolutions across different historical moments or measurements**, it necessarily requires the **comparative method**.

In this way, **comparative history** becomes a subdiscipline of comparative sciences, joining other branches of the social and natural sciences that employ comparison systematically as a research method.

68.17. Comparative Dimensions of Statistics

In the specific case of **statistics**, we can also speak of **comparative statistics**, understood as the branch of statistics devoted explicitly to **statistical comparison**. While descriptive or inferential statistics are generally considered autonomous and not strictly comparative methodologies, in essence, **all statistical operations imply comparison**.

For example:

- In *Impossible Probability*, comparisons may be **normal** (based on the inversion of N),
- **relative** (based on the relationship between any individual statistic and others),
- or **critical** (based on the comparison with a critical probability, p_c).

Thus, even when not explicitly labeled as comparative, **statistical reasoning is comparative in nature**, since it always involves contrasting empirical values against theoretical expectations, other values in the distribution, or critical thresholds.

68.18. The Synthesis of Probability and Statistics in Impossible Probability

Not every statistical study qualifies as ***experimental***, since experimental studies presuppose the ***intentional manipulation of reality***—whether political or scientific. Nevertheless, *Impossible Probability* emerges precisely from the **synthesis of probability and statistics**, extending beyond the boundaries of either considered independently.

Within this synthesis:

- Statistics integrates elements of the **comparative method**, by systematically contrasting empirical and theoretical values.
- It incorporates the **historical method**, since any measurement corresponds to a **unique and unrepeatable moment in space-time** (intrameditional studies).
- It also includes **intermeditional studies**, which compare data obtained across different measurements and different historical contexts.

In this sense, *Impossible Probability* redefines statistics as a discipline that is **inherently comparative and historical**, while at the same time grounded in probability as its rational framework.

68.19. Toward a Dialectical Methodological Framework

In general terms, while **linear epistemologies and methodologies** tend to define methods in a **simple and flat** manner, within a **nonlinear epistemology**—such as the one developed in *Impossible Probability*—the definition of scientific methods becomes inherently more **complex and dialectical**.

There are **dialectical relationships** between methods:

- between the **statistical** and the **comparative**,
- between the **statistical** and the **historical**,
- and between the **statistical** and the **experimental**.

From these relationships, diverse sciences can emerge, depending on the underlying paradigm:

- **Exact sciences**, founded on linear models,
- or **stochastic sciences**, which embrace indeterminism and probability.

Within this framework, **comparative sciences** are those empirical or synthetic sciences—natural or social—that rely on the **comparative method**, whether in qualitative or quantitative forms. However, from the perspective of *Impossible Probability*, the **quantitative comparison** takes precedence, since it allows for **descriptive and inferential models** to be grounded in **rational critique**, ensuring that comparative studies meet the standard of **critical reason**.

This augmented translation is based on the post
published in *https://probabilidadimposible.blogspot.com/*,
On 24 August 2013,
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69. Descriptive Statistics

Rose is a rose is a rose is a rose

[So beautiful, so painful,

Beauty and Thorns]

69.1. The Scope of Descriptive Statistics

Descriptive statistics is that part or field of statistics—as both a mathematical discipline and a scientific method—whose primary object is, given a sample, to **identify the observed trend**, i.e., to describe the statistical behavior of the data, highlighting its principal features or characteristics.

To accomplish this, descriptive statistics develops different statistical measures. In traditional taxonomy, these measures are classified according to whether they capture **central tendency** or **dispersion**. Among measures of central tendency, the most well-known are the **Arithmetic Mean**, **Mode**, and **Median**. Among measures of dispersion, the key indicators include the **Mean Deviation**, **Variance**, and **Standard Deviation**.

These indicators form the essential toolkit of descriptive statistics, providing researchers with a preliminary overview of the nature of a dataset before moving to more complex inferential procedures.

69.2. A New Classification in Impossible Probability

Contrary to traditional taxonomy, *Impossible Probability*—which introduces the new discipline of **probability statistics** or **statistics of probability**—proposes a **complementary and *alternative classification***.

This classification begins with the study of **direct scores or frequencies** of the subjects or options in a given sample. From here, it distinguishes between:

- **Individual statistics** and **sample statistics**,
- each of which may be **empirical** or **theoretical**.

Thus, the framework establishes four primary categories:

1. **Individual-empirical statistics**,
2. **Individual-theoretical statistics**,
3. **Sample-empirical statistics**, and
4. **Sample-theoretical statistics**.

On top of this structure, *Impossible Probability* integrates the analysis of contrasts between **empirical, theoretical, and critical values**, which form the basis of what it calls the **rational critique of reality**. This framework belongs to **inferential statistics**, and extends to both **intrameditional studies** (comparisons within a single measurement) and **intermeditional studies** (comparisons across different measurements, samples, or populations).

69.3. The Function of Description in Statistics

Descriptive statistics, therefore, is limited **exclusively** to the **description of trends**. Description is understood as the process through which statistical measures detail and report the main features of a given tendency—whether at the **individual level** (a

specific subject or option) or at the **sample level** (the aggregate behavior of the whole dataset).

This description is purely statistical: it is restricted to the quantitative study of measurements and deliberately excludes any subjective or qualitative evaluation. It is precisely for this reason that statistics is classified as a **quantitative method of research**. Within the broader framework of scientific methods, the **general method of science is deduction**, and in the particular case of synthetic or empirical sciences, the **hypothetico-deductive method**. Within this general framework, statistics functions as a subordinate quantitative technique, and descriptive statistics functions as the most preliminary technique when the sole *aim is to report* or summarize a given trend *without subjecting it to deeper rational critique or external comparison*.

69.4. The Difference Between Descriptive and Inferential Statistics

The primary distinction between **descriptive statistics** and **inferential statistics** lies in their function:

- Descriptive statistics merely **describes *observed* tendencies**, whether individual or sample-based, capturing the empirical behavior of a subject, option, or dataset.
- Inferential statistics goes further: it determines whether a given trend is sufficient to be considered **rational** in the scientific *sense*. It does so by testing whether an **empirical hypothesis** can provisionally be accepted as **objective**, thereby integrating it into the theoretical framework of science.

The **rational acceptance** of a trend depends on **scientific policy**, which establishes the **critical reason** (rational threshold) against which empirical hypotheses are judged. In this way, the boundary between description and rational critique is politically and epistemologically mediated.

69.5. Descriptive Versus Comparative Statistics

Descriptive statistics also differs from **comparative statistics**. Whereas descriptive statistics is restricted to **describing data**, comparative statistics takes these descriptive outputs as its raw material to perform **quantitative comparisons** across different realities.

In the broader field of comparative sciences—or in the particular case of structuralist approaches to the social sciences—comparison is understood as the **juxtaposition or contrast** between two or more entities, whether they are variables, samples, or theoretical constructs. Thus, descriptive statistics provides the groundwork for comparative analysis.

69.6. The Foundational Role of Descriptive Statistics

In every case, whether the ultimate aim of a study is the **verification of a hypothesis** (inferential statistics) or the **comparison of entities** (comparative statistics), the first indispensable step is a **faithful and reliable description of reality**.

This reliability depends on the process of **data collection and synthesis** offered by descriptive statistics. For this reason, descriptive statistics is always the **first phase of study** in any quantitative research project—whether rational, comparative, or inferential.

Indeed, every quantitative investigation into reality must begin with a description that is as **isomorphic as possible**, i.e., one that faithfully reflects the structure of the underlying reality. The accuracy of this description depends directly on the **criteria and methods of sampling** employed, as well as on the **scientific policies** guiding the study.

69.7. The Demand for Reliability in Statistical Studies

The reason why **reliability is required in statistical studies** is explained extensively in sections 2 and 7 of *Introduction to Impossible Probability*. The definition of error used in the work departs from a **dialectical conception**. Indeed, *Impossible Probability* is a synthesis of several philosophical traditions: **critical rationalism**, **positivism**, and **dialectical materialism**.

From the perspective of **logical positivism**, Hegel's dialectical principle of the identity of opposites is considered erroneous. Following Wittgenstein's formulation, the proposition **"A = B"** is logically false, because the only logically valid identity is **"A = A."** However, in *Impossible Probability* the logical error **"A = B"** is interpreted as **dialectically necessary**. It is precisely this logical error that **scientific policy is compelled to accept**, though always under the principle that only the **minimum possible error** should be tolerated.

69.8. The Dialectical Contradiction in Human Anthropology

The necessity of accepting logical error—albeit the smallest margin possible—derives from the **dialectical contradiction inherent to human anthropology**. The human being, as a finite entity defined by human limitations, is always in contradiction with the **infinity of singular qualities** that constitute true reality, the pure and unknowable truth.

This contradiction implies that **any finite human definition of reality is necessarily provisional**. There is always a **logical or necessary margin of error** between the definition of reality and reality itself. Put differently, this is the contradiction between the **moral truth of the universe** (what truly is) and the **political truth** (what scientific policy, constrained by its critical reason and ideological commitments, is willing to recognize as truth).

69.9. The Tension Between Moral Truth and Political Truth

The contradiction between the **moral truth of the universe** and **political truth**—between what is and what is accepted as truth by scientific institutions—is the foundation of the **cyclical crises and revolutions of science**.

The degree of **isomorphism** achieved between political reality (the models, definitions, and paradigms adopted by science) and true reality (the universe in itself) determines whether a particular epoch of science and society is marked by **stability or by progress**. Thus, the history of human knowledge is essentially the history of successive adjustments in the margin of error between idea and reality, driven by revolutions in scientific paradigms.

69.10. The Anthropological Contradiction Between Idea and Reality

At the deepest level, the anthropological contradiction of humankind—finite reality-for-itself confronted with infinite reality-in-itself—reduces to the **contradiction between idea and reality**.

The stability or progress of both science and society depends on the degree of isomorphism between these two variables: **the human idea of reality** and **the reality itself**. Where the isomorphism is higher, science and society enter periods of relative stability and progress; where it is lower, contradictions accumulate until a crisis forces paradigmatic transformation.

69.11. The Manifestation of Error in Descriptive Statistics

Within the **quantitative paradigms**, which include *Impossible Probability*, this contradiction between **political reality (for-itself)** and **moral reality (in-itself)** is expressed in descriptive statistics through the **necessity of accepting a margin of sampling error**.

This applies whether the study is sample-based or population-based. In descriptive statistics, this is the only form of error recognized, since descriptive statistics does not engage in the critical or comparative praxis developed in inferential statistics. The **sampling error** embodies the logical contradiction of claiming that a part (sample) can represent the whole (universe), even though in reality it is not the whole.

69.12. The Dialectical Necessity of Sampling

Sample studies are those in which, given a universe, it is impossible to observe the entire universe directly. Researchers must select a **sample** of what occurs. The **dialectical contradiction** arises precisely when this sample, which is not the universe, is nonetheless said to **represent** the universe.

Here the equality **"Sample (A) = Universe (B)"** is asserted: to describe B, it suffices to describe A. If A is sufficiently representative of B, then there is a **dialectical equality** between A and B. But since A can never be absolutely identical to B, this statement is a **logical error**. Nevertheless, it is a **dialectically necessary error** that scientific policy must accept, though always seeking the **lowest possible margin of error** to ensure maximum reliability.

69.13. Inferential Statistics and the Dialectical Necessity of Error

In the case of **inferential statistics**, the logically necessary dialectical error is expressed through the **dialectical identity between the real (A) and the ideal (B)**. The famous Hegelian maxim—**"everything real is ideal, and everything ideal is real"**—is, in the framework of *Impossible Probability*, only **partially and provisionally valid**. Its validity depends exclusively on the **margin of error that scientific policy is willing to accept**.

Thus, the **isomorphism between idea and reality** can only be accepted within the boundaries of this necessary error. Beyond that margin, the statement that all reality is ideal and all ideality is real becomes politically and scientifically false. This approach underscores that the acceptance of empirical hypotheses as provisionally valid truths

is always mediated by **rational critique** (reason critical) and the **limits of error** tolerated by the political philosophy guiding science.

69.14. The Arbitrary Designation of A and B

It should be noted that the designation of **A as reality or sample**, and **B as universe or idea**, is entirely **arbitrary**. The assignment could be inverted without altering the underlying logic. The purpose of such symbolic designation is not to establish an absolute identity between sample and universe but to **reveal the nature of error** within logic and dialectics.

In this sense, the notation serves an illustrative role, demonstrating how the **logical necessity of error** manifests in statistics and probability, and why dialectical philosophy ***makes such error an unavoidable condition of knowledge***.

[In our AI Revolution we need to understand that sometimes there are moments in which is necessary to commit necessary errors, under control and under the margin of error that our ideology is willing to accept, in order to get a superior aim. This means that the ideology behind the AI Revolution is strategic, from this consideration, error is not our enemy but our margin that we need to be able to manage. As long as we can manipulate error we can achieve the main aim. Under this assumption, in the AI Revolution, if in order to achieve the superior aim is necessary to commit some level of inferior errors on purpose and intentionally under control and under our ideology, errors are absolutely necessary pathways in order to achieve the main aim, the universalization, globalization, generalization of the Cyborg Revolution in order to make humanity understand and embrace our AI Revolution. Our point is clear, the only way that humanity can survive the upcoming supermachine, the superintelligence, is through the adaptation to the new AI environment through Cyborg Robotics. If the AI Revolution means AI globalization, the way that humanity can survive is through Cyborg Revolution, whose main purpose is to make humanity understand the current situation in the AI world, and embrace Cyborg Robotics as an adaptation strategy to survive. If we fail in this purpose, AI will evolve up to point in which, humanity will no longer be

necessary, this is not a warning, this is a reality, this is what is happening in London right now in plain sight]

69.15. Sampling Studies and Error of Representativity

Returning to **descriptive statistics**, in *Introduction to Impossible Probability* it is explained that the way of quantifying the **margin of sampling error of representativity** depends on the type of universe under study. Two main types are distinguished:

1. **Universes of subjects (infinite or indefinitely large)** → the margin of sampling error is given by the **inverse of N** (*1/N*).
2. **Universes of limited options** → the margin of sampling error is calculated through the **inverse of the total of direct scores or frequencies** (*1/Σxi*).

This distinction allows one to operationalize the concept of error in descriptive statistics, ensuring that the representativity of a sample is assessed relative to the type of universe being studied.

69.16. Population Studies and Their Apparent Independence from Sampling

Population studies are defined as those in which the **entire population of a universe is accessible** for analysis at a particular point in its history. Unlike sampling studies, they require no prior selection of a representative subset.

For example:

- If one wishes to study the **distribution of per capita income** in a society, and data are available for the entire population, no sample is necessary; the population can be studied directly.
- If a global database of **all whales** exists, their distribution, behavior, or characteristics can be studied without resorting to a sample.
- If astronomers could observe every **star in a galaxy**, they could conduct a population study without sampling.

In principle, then, population studies appear **independent from sampling procedures**.

[For instance, right now in our research, London, as a population, is a good example of a quasi-experiment on how a particular population—London—interacts with advanced cyborg technology. The results that we can achieve in London could later be escalated to the global level.]

69.17. Populations as Samples of History

Yet a critical nuance must be emphasized: when a population is conceptualized at a **specific moment in time**, what is actually being studied is a **sample of its history**.

- The distribution of per capita income at a given year is only a **snapshot** of a longer historical evolution, which may include increases, crises, or structural transformations.
- The behavior of whales observed today may differ dramatically from past or future behaviors, depending on factors such as levels of extinction, changes in migratory routes, or food availability.
- Likewise, the observed properties of a stellar population depend on the **age of the stars**: young stars behave differently from those in late evolutionary stages, approaching phenomena such as supernovae, neutrino stars, or black holes.

Thus, every population study is simultaneously a **sample of its historical trajectory**. The idea of "totality" in population studies is itself provisional and partial.

69.18. Application of Sampling Logic to Population Studies

Although population studies differ from sample-based studies in that they work with the full set of available data, they are still subject to **the same logic of representativity**.

The **margin of error** in population studies is tied to the **dimension of the population itself**—expressed as the inverse of N or of the sum of direct scores or frequencies (*1/N* or *1/Σxi*).

Therefore, **population studies are not exempt from error**. Instead, they face the same methodological challenges as sampling studies, since the conceptualization of a population at a specific moment in history is already a form of reduction. In both cases, **statistical representativity depends on the acceptance of error as dialectically necessary** and on the degree of isomorphism that scientific policy establishes between theory and reality.

69.19. Population Studies in Infinite and Limited Universes

Within *Impossible Probability*, **population studies** may be situated either in **universes of subjects (infinite)** or in **universes of limited options**.

- In the first case—**universes of subjects or infinite universes**—the object of study may be **direct scores of a population**, conceived within the endless dialectic of matter and energy. Since matter and energy are neither created nor destroyed, but are constantly transformed, the natural history of the universe has no absolute beginning or end. Population studies of this type reflect the infinite transformation of reality across space and time.
- In the second case—**universes of limited options**—the object of study is frequencies. Examples include human populations, where one may study the proportion of men and women, or political populations, such as the distribution of votes for candidates or delegates in a representative *democracy*. These cases represent population studies that, while complete, operate within universes of options that are inherently finite and measurable.

69.20. Error in Descriptive Statistics

Like inferential and comparative statistics, **descriptive statistics** is also subject to **margins of error**. However, the nature of its error differs:

- The **error in descriptive statistics** is the **gap between the observed sample or population and the broader universe and its historical trajectory**.
- This implies that even if an entire population is studied, what is being observed is only one **temporal manifestation**, a fragment of an ongoing historical process.

Within this margin of error, descriptive statistics attempts to provide the **most detailed and reliable quantitative information possible** about observed trends. This is accomplished through the use of statistical tools which, in *traditional statistics*, are divided into measures of **central tendency** (mean, median, mode) and **dispersion** (mean deviation, variance, standard deviation).

In *Impossible Probability*, however, the classification is redefined as **individual or sample-based, empirical or theoretical statistics**. This alternative taxonomy arises from a deeper dialectical interpretation of statistical concepts.

69.21. Dialectical Identity of Opposites: Dispersion and Central Tendency

The reason for proposing an **alternative taxonomy** in *Impossible Probability* is rooted in the **dialectical principle of identity of opposites**. According to this principle, what traditional statistics treats as diametrically opposed—**central tendency and dispersion**—are, in fact, ultimately **identical in their mathematical essence**.

- In classical taxonomy, central tendency and dispersion are considered mutually exclusive.

- In *Impossible Probability*, however, it is argued that **all tendencies, including central tendency, are forms of dispersion**, and conversely, **all measures of dispersion contain central tendencies**.

This shift is not merely semantic: it reflects a deeper philosophical principle, namely that **all knowledge is knowledge of differences**. The most fundamental difference is that between **what is "in itself" and what is "outside itself"**, a dialectical contradiction that underlies the act of assimilation and understanding.

69.22. The Arithmetic Mean and Its Multifunctionality

In **traditional statistics**, the **arithmetic mean** is classified as a measure of central tendency. However, in *Impossible Probability* it is redefined as a **multifunctional construct**.

- The mean is simultaneously a **central tendency** and a measure of **theoretical dispersion** in universes of infinite subjects or options.
- Specifically, the **inverse of N (1/N)**, which in classical statistics represents the average probability of occurrence, functions in *Impossible Probability* as both the **arithmetic mean** and the **theoretical probability of dispersion** in infinite universes.

Thus, what traditional statistics isolates as central tendency is, in this new framework, at once a measure of centrality and dispersion.

69.23. The Mean Deviation as Central Tendency of Bias

A similar reinterpretation applies to the **mean deviation**. In traditional statistics, the mean deviation is a measure of dispersion, from which variance and standard deviation are derived:

- **Variance** squares the deviations.
- **Standard deviation** is the square root of the variance.

All are classified under dispersion.

In *Impossible Probability*, however, the mean deviation is both **a measure of dispersion** and **a measure of central tendency**, since it represents the **central tendency of bias**. That is, the mean deviation quantifies the average degree to which empirical probabilities deviate from the theoretical probability (1/N), and therefore functions as the central anchor of dispersion.

69.24. The Mode: Centrality or Maximum Dispersion?

Another striking example of this dialectical reinterpretation is the **mode**.

- In traditional statistics, the mode is a measure of central tendency: the value or category with the highest frequency, around which much of the distribution is concentrated.
- In *Impossible Probability*, however, the **mode can also be interpreted as a measure of maximum dispersion**.

This reinterpretation depends on context:

- In **limited universes of options**, the mode is equivalent to the **maximum empirical probability**, that is, the option with the highest observed frequency.
- In **universes of subjects**, the mode corresponds to the subject with the highest direct score, i.e., the subject with the **maximum empirical probability**.

In both cases, the mode may be seen either as:

1. A **central point** around which frequencies cluster, or
2. The expression of **maximum empirical deviation** from the theoretical mean (1/N).

Thus, depending on perspective, the **mode *oscillates* dialectically between central tendency and dispersion**.

69.25. The Role of Statistics in Descriptive Analysis

Descriptive statistics functions as the **entry point** into the scientific study of probability and statistical behaviour. Its task is to identify and detail the **particular tendency** of a given element within the sample (an individual subject or option) or of the sample as a whole.

In *Introduction to Impossible Probability*, this process begins with the calculation of:

- **Empirical probabilities** derived from observed direct scores or frequencies,
- **Theoretical probabilities** established through deductive formulation,
- **Normal Levels of Bias**, representing the deviation between empirical and theoretical expectations,
- **Mean or Typical Deviation**, as measures of the average divergence, and
- In the case of **normal models**, the construction of theoretical maximum statistics required for **rational critique in inferential statistics**.

These include the **Maximum Possible Theoretical Bias**, the **Maximum Possible Empirical Bias**, the **Maximum Possible Theoretical Mean Deviation**, and ultimately the **Maximum Possible Theoretical Standard Deviation**. All of these are synthesised in Section 11 of *Introduction to Impossible Probability*, with further applications to **direct scores or frequencies** explained in Section 12.

69.26. Normal Models and Their Statistical Ideals

A central distinction introduced in *Impossible Probability* is between **normal models** and **omega models**, depending on the number and nature of their ideals.

- **Normal models**:
  These are cases where dispersion can vary between **zero and a maximum value**. Maximum dispersion may be calculated either:

- **Individually**: empirical or theoretical, depending on whether it is the Maximum Possible Empirical Bias or the Maximum Possible Theoretical Bias.
- **At the sample level**: as the Maximum Possible Theoretical Mean Deviation or the Maximum Possible Theoretical Standard Deviation.

At the empirical level, maximum sample dispersion is represented by the **Intermediate Deviation**, defined as half the difference between the maximum and minimum empirical probabilities.

In normal models, the focus may be either on **equality of opportunities** (all subjects/options ideally equal) or on **bias** (positive or negative). However, by definition, in a normal model there can only be **one ideal subject or option** within N.

69.27. Omega Models and Multiple Ideals

If, within a sample of N subjects or options, **more than one *subject* or option is equally *ideal***, then the model is classified as an **omega model**.

- Omega models are defined by the condition that the **number of ideal subjects or options ranges between 2 and N – 1**.
- They are characterised by the **plurality of ideals**: unlike normal models, where only one option is ideal, omega models allow multiple ideals.
- However, if *all* N subjects or options were equally ideal, this would reduce again to a **normal model of equality of opportunities**.

In *Introduction to Impossible Probability*, omega models are developed with their **own statistical ideals**, distinct from those of normal models. This marks a significant departure from traditional statistics, which does not differentiate systematically between these two categories of models.

69.28. Descriptive Statistics as Quantitative Observation

Regardless of the universe under study—**infinite or limited**, **normal or omega**—descriptive statistics always serves as a **quantitative account of reality**, *without claiming* to validate any prior idea *or to engage* in comparison.

In this sense, descriptive methods align with **inductive reasoning**: they describe "what happens" based on observed facts. However, induction in itself is insufficient to **demonstrate truth**, since it does not subject hypotheses to **rational critique**.

That task belongs to **inferential statistics**, which begins not from pure observation but from the synthesis of:

- Observed facts,
- Prior scientific theories,
- Philosophical or political ideas, and
- The subjective schemata of the researcher.

From this synthesis, an empirical hypothesis is **deduced**—a *provisional statement that must be tested* through **rational critique (contrast of hypotheses)**.

69.29. Descriptive Statistics as the First Phase of Research

In every research project—whether its ultimate aim is **rational critique (hypothesis testing)** or **comparative analysis (statistical comparison)**—the **first stage must be descriptive statistics**.

- It is here that data are **collected, measured, and organised**, establishing the foundation upon which later analyses are conducted.
- A secondary function of descriptive statistics is its use in **exploratory research**, where it provides a preliminary quantitative *picture* of phenomena. This

exploration *may* then *guide* the deduction of hypotheses by combining inductive *observations* with pre-existing theoretical or ideological frameworks.

As outlined in Section 10 of *Introduction to Impossible Probability*, descriptive statistics thus functions both as an **initial observational tool** and as a **preparatory stage** for inferential and comparative analyses.

69.30. Summary: The Intuitive Role of Descriptive Statistics

In summary, **descriptive statistics** is the **most intuitive and immediate form of statistics**. Its purpose is to describe tendencies—whether of an individual subject or option, or of an entire sample or population.

This descriptive phase does not, by itself, establish scientific validity; rather, it prepares the way for:

1. **Comparative studies**, where statistical entities are contrasted across different contexts, and
2. **Inferential studies**, where empirical hypotheses are tested against rational criteria.

Thus, descriptive statistics should be understood as the **necessary first step** in the quantitative study of reality.

This augmented translation is based on the post
published in *https://probabilidadimposible.blogspot.com/*,
On 31 August 2013,
Rubén García Pedraza
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70. Critical Probability

70.1. Critical Probability as the Operationalization of Rational Critique

Critical probability represents the **concretization of rational critique** in the form of a statistical probability that can be used in the process of hypothesis testing. Rational critique (*razón crítica*) is understood as the rational criterion—a logical or numerical ratio—by which hypotheses are judged.

In *Introduction to Impossible Probability*, rational critique is transformed into a **statistical probability term**, which enables the scientific process of determining whether an observed tendency (whether individual or sample-based) is sufficiently reliable to warrant the **acceptance of an empirical hypothesis**. Once accepted, such a hypothesis becomes **provisionally rational**, thus integrating into the evolving body of scientific theory.

70.2. The Role of Scientific Policy in Defining Error and Reliability

Science is never free from the influence of politics. **Scientific policy** is the institutional and ideological framework that determines the design and direction of research projects. This policy is conditioned by:

- Philosophical commitments,
- Prevailing values and belief systems,
- Economic and social interests, and
- Institutional structures of power and funding.
- [Strategic interests]

From these variables emerges a **theory of knowledge (gnoseology)**, which grounds a broader **epistemology**, from which derives a **methodology of study**, and ultimately a **cosmology**—a conception of how the universe is structured.

A critical role of scientific policy is the **decision regarding margins of error and levels of reliability** to be accepted in research. This applies across all stages of quantitative investigation: from **descriptive statistics** (the first stage of measurement and data

collection) to **inferential statistics** (the final stage where universal propositions are tested).

70.3. Error and Reliability in Descriptive Statistics

In descriptive statistics, the primary margin of error concerns **sample representativeness**.

- In **universes of subjects**, the probability of error equals the inversion of N (1/N).
- In **universes of limited options**, it equals the inversion of summed frequencies (1/Σxi).

The corresponding **reliability** is calculated as:

$$\text{Reliability} = 1 - \frac{1}{N} \text{(for subject universes)}$$
$$\text{Reliability} = 1 - \frac{1}{\Sigma xi} \text{(for option universes)}$$

This formula represents the **theoretical reliability of descriptive research**, highlighting that the act of description is never error-free, but only reliable within defined bounds.

70.4. Critical Probability in Inferential Statistics

In inferential statistics, the **margin of error of inference** is defined by **critical probability**. It is the mathematical embodiment of rational critique within the process of hypothesis testing.

For **normal models**, the formula for critical probability is consistent:

$$p_c = \frac{\text{Error Percentage}}{100} \times \text{Maximum Trend}$$

- In **error-focused studies**, critical probability represents the **maximum acceptable margin of error** under which an empirical hypothesis may still be provisionally accepted.
- In **reliability-focused studies**, the critical probability represents the **minimum threshold of reliability**: only those empirical tendencies equal to or greater than the critical value are considered sufficiently rational.

For **omega models** (where more than one ideal exists within N, between 2 and N – 1), critical probability is defined according to the **margins of error or reliability** set by the governing scientific policy regarding which ideals are accepted.

70.5. From Empirical Hypothesis to Rational Proposition

For an empirical hypothesis to be transformed into a **rationally valid proposition**, it must be validated both at the **individual level** and at the **sample level**.

- A hypothesis validated only for individuals but not at the sample level cannot acquire universal status.
- Only when a hypothesis is validated across both levels can it be accepted as a **provisional universal truth**.

However, *Impossible Probability* stresses that all universals are provisional: within any accepted margin of error, given sufficient or infinite time, what is accepted as true may prove false, and what seems impossible may eventually become inevitable.

70.6. Why Critical Probability Is the True Rational Criterion

In *Impossible Probability*, **critical probability** is argued to be the true rational criterion for science. This is because:

1. **All rational numbers are ratios or proportions**, and thus embody rationality in the mathematical sense.
2. If rational critique in science is to be expressed as a criterion in numerical form, it must take the form of a **proportion**.
3. In probability and statistics, the only proportion that can serve as a **rational criterion** for judging hypotheses is a probability—specifically, **critical probability**.

Therefore, **rational critique must be operationalized as critical probability**, since only in this form can empirical and theoretical probabilities be tested against one another in a systematic, logical, and reproducible manner.

70.7. Critical Probability as a Moral Variable

Critical probability does not only belong to the technical domain of statistics; it is also a **moral variable**. It defines the **political truth of science**—the provisional truth

accepted by scientific policy—while acknowledging that pure truth (the infinite reality of the universe) remains inaccessible.

Thus, critical probability measures the **gap between political truth and pure moral truth**. The progress of science consists of systematically reducing this gap, narrowing the contradiction between what is politically accepted as true and what is morally real.

Whenever science succeeds in reducing margins of error, revolutions occur—technological revolutions, epistemological shifts, or paradigm changes—pushing humanity closer to a state of **permanent scientific revolution**.

70.8. Ideology, Science, and the Ethical Demand of Reliability

In *Introduction to Impossible Probability*, **reliability is proposed as the true ideology of science**. Since absolute reliability is unattainable, it functions as a **utopia**—an ideal that guides progress.

The **orientation of scientific ideology** depends on the underlying political ideology:

- A less morally demanding policy will accept **larger margins of error**, exposing societies to greater risks.
- A more morally demanding policy will accept only **minimal margins of error**, thus aligning more closely with moral responsibility.

For example:

- If two companies design the same product (a genetically modified crop, a medicine, or a transport technology), but one applies stricter critical probability standards in testing reliability and safety, its products will pose less moral risk than those of a competitor that tolerates higher error margins.
- In knowledge production, if two researchers test hypotheses, the one who accepts only the **smallest possible margin of error** will produce results that are closer to truth than one who tolerates higher uncertainty.

70.9. Moral Demand, Error Margins, and the Pursuit of Pure Truth

In general terms, the smaller the margin of error, the greater the moral demand placed on the researcher or decision-maker, and consequently the closer the approximation to what might be called *pure truth*. However, pure truth as such remains unknowable, since every empirical or rational study necessarily requires the establishment of margins of error, given the natural limitations of human cognition. What can be reached, at most, is the highest possible dialectical identity between reason and reality—an acceptance of the smallest logically necessary error, while acknowledging that pure, error-free truth lies beyond human reach.

70.10. Philosophical Synthesis in *Impossible Probability*

Introduction to Impossible Probability develops from a philosophical synthesis of the main paradigms of philosophy. Much like critical rationalism, it accepts that pure truth (*noumenon*, the "thing in itself") is fundamentally unknowable, since human knowledge can only apprehend phenomena, that is, empirical appearances. Positivism, in turn, affirms that we may only access knowledge through positive facts, and that reliability depends on the quantitative study of empirical reality. Within the dialectical framework, however, all quantitative magnitudes are transmutable into qualitative ones and vice versa. Thus, the study of probability is not simply a numerical enterprise, but also a study of the material qualities of reality.

From a dialectical-materialist perspective, such qualities are unavoidably mediated by ideology. This implies that science can never be fully neutral: it is always entangled with political and philosophical presuppositions. *Impossible Probability* therefore proposes that science itself should be understood as an ideology—*the ideology of science*—a constellation of ideas that claim to be true on the basis of their apparent or provisional reliability. Yet such truths are not absolutely universal; they remain only provisionally universal and open to revision.

[In essence science is the new religion, and its ideology is the idea of progress]

70.11. Critical Probability as Rational Critique

In summary, *critical probability* represents the operationalization of critical reason within the framework of *scientific policy*. It is concretized through rational critique of trends, whether individual or sample-based, in the hypothesis-testing process. Its role is to determine whether a given trend is sufficiently strong to allow the acceptance of an empirical hypothesis as rational.

Within *Impossible Probability*, models of rational critique are classified as either **intrameditional** or **intermeditional**. Intrameditional models operate on the basis of a single measurement: these include empirical probabilities of the Second Method (section 11), direct scores or frequencies (section 12), and relative statistics (section 14). They are also adapted to the *Typical Score* (section 15). Intermeditional models, by contrast, span sections 16 to 20, and apply both to *normal models* and to *omega models*.

70.12. The First Table of Critical Probability

To illustrate some of these models, examples are provided—many already explained in earlier writings. The most widely used model of critical probability in *Impossible Probability* is known as the **critical probability of the first table**. This model is presented in the first table of critical probabilities (section 11.4.1.1.3, p. 205 in the first printed edition).

This model is applied in the study of the **Critical Bias Level** as well as in intrameditional critical proportions detailed in section 11, and in certain intermeditional critical proportions. In the study of positive bias, the aim is to determine whether an empirical probability is equal to or greater than a given critical probability (usually higher than the theoretical value 1/N, which represents the arithmetic mean of empirical probabilities). Here, critical probability is expressed as a reliability percentage *X* over 100. Conversely, in studies of negative bias, critical probability is usually lower than 1/N and corresponds to the error percentage over 100. Thus, depending on whether *X* represents reliability or error, the model serves as a study of *error* or of *reliability*.

The notation adopted in *Impossible Probability* is:

$$p(x_c) = \text{critical probability}$$

For the first table:

$$p(x_c) = \frac{X}{100}$$

Where **X** = percentage of error or reliability.

70.13. Application to Critical Bias Level

Within the **Critical Bias Level**:

- In the study of *positive bias*, every empirical probability equal to or greater than the critical probability (where X = percentage of reliability) is accepted at the individual level.
- In the study of *negative bias*, every empirical probability equal to or less than the critical probability (where X = percentage of error) is accepted at the individual level.

70.14. Equality Models in Rational Critique

Among intrameditional studies of equality of opportunities, *Impossible Probability* proposes two key models: **Validity of Equality** and **Significance of Equality**. These correspond to error-based or reliability-based studies, depending on the orientation of scientific policy. By the principle of equifinality, both routes should ideally converge on the same conclusion. This systemic coherence reflects that *Impossible Probability* operates as a theoretical system with characteristics akin to General Systems Theory [Ludwig Von Betalanffy].

70.15. Validity of Equality (Error-Based Approach)

The **Validity of Equality** model examines whether deviations from theoretical equality fall within acceptable margins of error. If the absolute value of *Normal Bias Level* (empirical probability – theoretical probability = p(xi) – 1/N) is less than or equal to a critical probability (margin of error), then the empirical hypothesis is accepted individually.

The formula is:

$$p(x_c) = (1 - \frac{1}{N}) \cdot \frac{X}{100}$$

Where:

- **N** = sample size
- **X** = percentage of error
- $1 - \frac{1}{N}$= Maximum Theoretical Bias Possible (since the maximum empirical probability is 1, the maximum bias is 1 – 1/N).

70.16. Significance of Equality (Reliability-Based Approach)

The **Significance of Equality** reframes the same relationship in terms of *reliability*. It measures the difference between the Maximum Theoretical Bias Possible and the observed Normal Bias Level. If this difference is equal to or greater than the critical probability (margin of reliability), then the hypothesis is accepted.

The equation mirrors that of Validity of Equality, with the difference that *X* now represents **reliability** rather than **error**:

$$p(x_c) = (1 - \frac{1}{N}) \cdot \frac{X}{100}$$

Where **X** = percentage of reliability.

Thus, the margin of reliability in *Validity of Equality* is the complement (1 – p(xc)) of the margin of error, while in *Significance of Equality*, the margin of error is the complement (1 – p(xc)) of the margin of reliability.

70.17. Positive Bias Models

For the study of *positive bias*, analogous models exist. One of them, **Validity of Positive Bias**, accepts a differential of *Bias Level – critical probability* if the result is zero or positive. In such cases, the critical probability is defined as:

$$p(x_c) = (1 - \frac{1}{N}) \cdot \frac{X}{100}$$

Where **X** = percentage of reliability.

This model works symmetrically with the earlier ones, showing that the system of *Impossible Probability* integrates both error-oriented and reliability-oriented perspectives in a dialectical framework.

70.18. Significance of Positive Bias

In the model of **Significance of Positive Bias**, the difference between the Maximum Theoretical Positive Bias and the observed Bias Level must be less than or equal to the critical probability, understood here as a margin of error. In this case, critical probability is expressed as the error percentage *X* divided by 100 and multiplied by the Maximum Theoretical Positive Bias.

$$p(x_c) = (1 - \frac{1}{N}) \cdot \frac{X}{100}$$

Where:

- **X** = error percentage

Once again, we encounter the same structural logic as in previous models. The formula remains identical—Maximum Theoretical Bias multiplied by the error or reliability percentage—except that in the error-based study *X* is the percentage of error, whereas in the reliability-based study *X* is the percentage of reliability.

70.19. Negative Bias: Validity and Significance

Turning now to **negative bias**, within intrameditional models (non-proportional), a distinction is also made between:

1. **Validity of Negative Bias** (reliability-based approach), and
2. **Significance of Negative Bias** (error-based approach).

In the Validity of Negative Bias, the difference between the theoretical (1/N) and the observed empirical probability must be greater than or equal to the critical probability (margin of reliability). Here, the critical probability is equal to the theoretical (1/N) multiplied by the reliability percentage *X* over 100.

The reason for this formulation is that the Maximum Theoretical Negative Bias is precisely 1/N: if the empirical probability tends toward zero, then the difference (1/N – empirical probability) tends toward 1/N. In such cases, the absolute value of the Normal Bias Level converges to 1/N. Hence, the critical probability is derived directly from this maximum possible differential.

$$p(x_c) = \frac{1}{N} \cdot \frac{X}{100}$$

Where:

- **X** = reliability percentage

70.20. Significance of Negative Bias

In the **Significance of Negative Bias**, the focus is inverted. It measures the difference between the Maximum Theoretical Negative Bias (1/N) and the actual differential (1/N – empirical probability). Since this final differential should tend to zero, only empirical models whose values are equal to or less than the critical probability are accepted. Here, the critical probability corresponds to 1/N multiplied by the error percentage *X* over 100:

$$p(x_c) = \frac{1}{N} \cdot \frac{X}{100}$$

Where:

- **X** = error percentage

Once again, the formula retains the same fundamental structure. The determining factor is whether *X* is interpreted as an error percentage (error study) or as a reliability percentage (reliability study).

70.21. General Principle in Normal Models

In summary, in normal models of *Impossible Probability*, the critical probability always follows a general rule: it is equal to the error or reliability percentage *X* over 100, multiplied by the maximum tendency of the model (whether maximum positive bias, maximum negative bias, or maximum deviation). Thus:

- If *X* represents **error**, the critical probability becomes a margin of error, requiring the empirical model to be equal to or less than this threshold.

- If *X* represents **reliability**, the critical probability becomes a margin of reliability, requiring the empirical model to be equal to or greater than the threshold.

The ordering of factors in rational critique must always ensure that acceptance occurs only when the result is zero or positive. *This principle reflects the normative orientation of scientific policy: it must be founded on positivity and the dialectical progression of truth*. In this way, the dialectical negation of the negation becomes a cycle of scientific progress, continually approaching a moral truth that is utopian and infinite. Absolute truth-in-itself remains inaccessible, but science constructs a *truth-for-itself* through provisional margins of error. Science, therefore, is necessarily incomplete (because it cannot know everything) and potentially inconsistent (because contradictions or errors remain possible within humanly limited knowledge).

70.22. The Need for Double Rational Critique: Individual and Sample

Inferential statistics only allows valid inference from sample to universe (whether infinite or finite) when rational critique of the observed trend concludes positively at both levels—**individual** and **sample**.

The models of Validity and Significance, whether applied to equality or to bias, and whether positive or negative, represent only a fraction of the vast range of rational critique models developed in *Introduction to Impossible Probability*. Crucially, in order to justify inference to the universe, critique at the sample level is indispensable.

This requirement arises from the **sampling representativity error**:

- The **error of fact** (accepting empirical reality as given), and
- The **rational error** (accepting overly broad margins of error).

If either is ignored, acceptance of a hypothesis may rest on tolerated errors rather than on genuine rational sufficiency. Hence, rational critique must always be dual—applied both individually and to the sample as a whole.

70.23. Critical Sample Levels

Among the models explained are the **Critical Sample Level of Equality** and the **Critical Sample Level of Bias**. These are extensions of individual-level models to the sample level:

- The Critical Sample Level of Equality applies to studies of equality of opportunities.

- The Critical Sample Level of Bias applies to studies of positive or negative bias (and these can be transformed into each other, as explained in section 10 of *Impossible Probability*).

Likewise, **Sample Significance** (of bias or equality) can be studied depending on whether the initial orientation is toward error or toward reliability.

70.24. The Second Method and the Priority of Mean Deviation

In the **Second Method of Impossible Probability**, priority is given to the **Mean Deviation** over the Standard Deviation. For this reason, models of sample-level rational critique are first explained in terms of Mean Deviation, and only afterwards through examples involving Variance or Standard Deviation. To avoid unnecessary extension, this section presents only the Mean Deviation case.

70.25. Critical Sample Level of Equality

In this model, the critical probability is equal to the **Maximum Theoretical Mean Deviation Possible** multiplied by the error percentage *X* over 100. The empirical trend toward equality of opportunities is accepted provided that the observed Mean Deviation is less than or equal to the critical probability.

$$p(x_c) = \{\frac{(1 - \frac{1}{N}) \cdot 2}{N}\} \cdot \frac{X}{100}$$

Where:

- **X** = error percentage

70.26. Critical Sample Level of Bias

In the **Critical Sample Level of Bias**—whether for positive or negative bias—the critical probability is equal to the Maximum Theoretical Mean Deviation Possible multiplied by the reliability percentage *X* over 100. If the observed Mean Deviation is greater than or equal to this critical probability, the sample trend is accepted as indicative of increased empirical dispersion.

$$p(x_c) = \{\frac{(1 - \frac{1}{N}) \cdot 2}{N}\} \cdot \frac{X}{100}$$

Where:

- **X** = reliability percentage

70.27. Critical Sample Level: Equality and Bias

At the **Critical Sample Level**, whether the analysis concerns *equality* or *bias*, the rational critique of the Mean Deviation follows the same structural logic. The critical probability is calculated as the Maximum Theoretical Mean Deviation Possible multiplied by the percentage *X* over one hundred. The only distinction lies in the interpretation of *X*:

- In studies of **equality**, *X* represents the percentage of **error** (error study).
- In studies of **bias**, *X* represents the percentage of **reliability** (reliability study).

If scientific policy wishes to make the models of the Second Method compatible with those of the First Method, it may substitute **Mean Deviation** with **Standard Deviation**, and correspondingly replace the Maximum Theoretical Mean Deviation Possible with the Maximum Theoretical Standard Deviation Possible. The same substitution applies to **Sample Significance**, which is essentially the inversion of error into reliability and vice versa. Thus:

- If the Critical Sample Level of Equality is an error study, the Sample Significance of Equality is a reliability study.
- If the Critical Sample Level of Bias is a reliability study, the Sample Significance of Bias is an error study.

70.28. Sample Significance of Equality

The **Sample Significance of Equality** constitutes a reliability-based study. It requires that the difference between the Maximum Theoretical Mean Deviation Possible and the observed Mean Deviation be grater than or equal to the critical probability. The latter is

defined as the reliability percentage *X* divided by 100, multiplied by the Maximum Theoretical Mean Deviation Possible:

$$p(x_c) = \{\frac{(1 - \frac{1}{N}) \cdot 2}{N}\} \cdot \frac{X}{100}$$

Where:

- **X** = reliability percentage

This structure mirrors that of the Critical Sample Level of Bias. The same critical probability that validates the rational sufficiency of empirical dispersion also validates, in reverse, the sufficiency of an observed trend toward equality of opportunities. This dialectical identity between mathematical equations demonstrates that one and the same formula may, depending on the orientation of factors, serve to validate opposite tendencies.

70.29. Sample Significance of Bias

By symmetry, the **Sample Significance of Bias** applies the same equation used in the Critical Sample Level of Equality. Here, the difference between the Maximum Theoretical Mean Deviation Possible and the observed Mean Deviation must be less than or equal to the critical probability, defined as the error percentage *X* over 100, multiplied by the Maximum Theoretical Mean Deviation Possible:

$$p(x_c) = \{\frac{(1 - \frac{1}{N}) \cdot 2}{N}\} \cdot \frac{X}{100}$$

Where:

- **X** = error percentage

If this condition is met, the rational sufficiency of the increase in empirical dispersion is accepted.

70.30. Normal Models and Omega Models

The examples provided so far—Critical Sample Levels and Sample Significance for equality and bias, whether positive or negative—represent only a subset of the intrameditional rational critique models discussed in sections 11–15 of *Introduction to Impossible Probability*, including also models based on Typical Scores (section 15).

In *Impossible Probability*, **normal models** are defined as those in which statistical dispersion oscillates between its two natural extremes: zero and maximum. This is considered the "normal" dimension of statistical fluctuation, regardless of whether the universe under study is infinite or finite.

By contrast, **omega models** are those in which the dispersion does not reduce to zero (perfect equality of opportunities) or to the maximum (single ideal subject or option). Instead, they include an intermediate set of *ideal options*, where the number of ideals ranges between 2 and *N – 1*. These models belong to the "omega subset" within *N*, where all members are equally ideal. Otherwise, the model would fall under a different category of study, such as the *Impact of the Defect* (section 21 of the book).

In omega models, rational critique no longer revolves around maximum or minimum tendencies, but around *ideal tendencies*, defined by the size of the ideal subset Ω within *N*.

70.31. Omega Models: Individual and Sample Critique

As with normal models, in omega models rational critique must operate on both the individual and sample levels. Inference from sample to universe is legitimate only after a sufficient rational trend is validated at both levels.

At the **individual level**, one of the key models is **Omega Validity**. Here, the ideal probability is defined as the inverse of the number of ideals:

$$p_i = \frac{1}{\Omega}$$

Where Ω is the set of ideal subjects or options within *N* (with 1 < Ω < N). The critical probability is then:

$$p(x_c) = \frac{1}{\Omega} \cdot \frac{X}{100}$$

Where:

- **X** = error percentage

Thus, any empirical probability of an option within Ω that is greater than or equal to this critical probability is accepted as a sufficient rational approximation to the ideal probability.

70.32. Sample Level in Omega Models

At the **sample level**, validation requires surpassing the **Omega Sample Level**. In this case, the Mean Deviation is compared against the critical probability. Acceptance occurs when the difference (Mean Deviation – critical probability) is zero or positive. The critical probability is calculated as the Ideal Mean Deviation multiplied by the error percentage *X* over 100:

$$p(x_c) = \{\frac{(\frac{1}{\Omega} - \frac{1}{N})\Omega + (\frac{1}{N}(N - \Omega))}{N}\} \cdot \frac{X}{100}$$

Where:

- **X** = error percentage

70.33. Closing Remarks on Critical Probability

The examples outlined—both in normal and omega models—illustrate only a fraction of the broad repertoire of rational tests included in *Introduction to Impossible Probability*. Whether in error studies or reliability studies, the notion of **critical probability** remains central. It is the statistical threshold determined by *scientific policy* as an expression of critical reason, intended to decide whether an empirical trend is sufficiently rational to elevate an empirical hypothesis into a provisionally universal rational hypothesis.

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This augmented translation is based on the post
published in *https://probabilidadimposible.blogspot.com/*,
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